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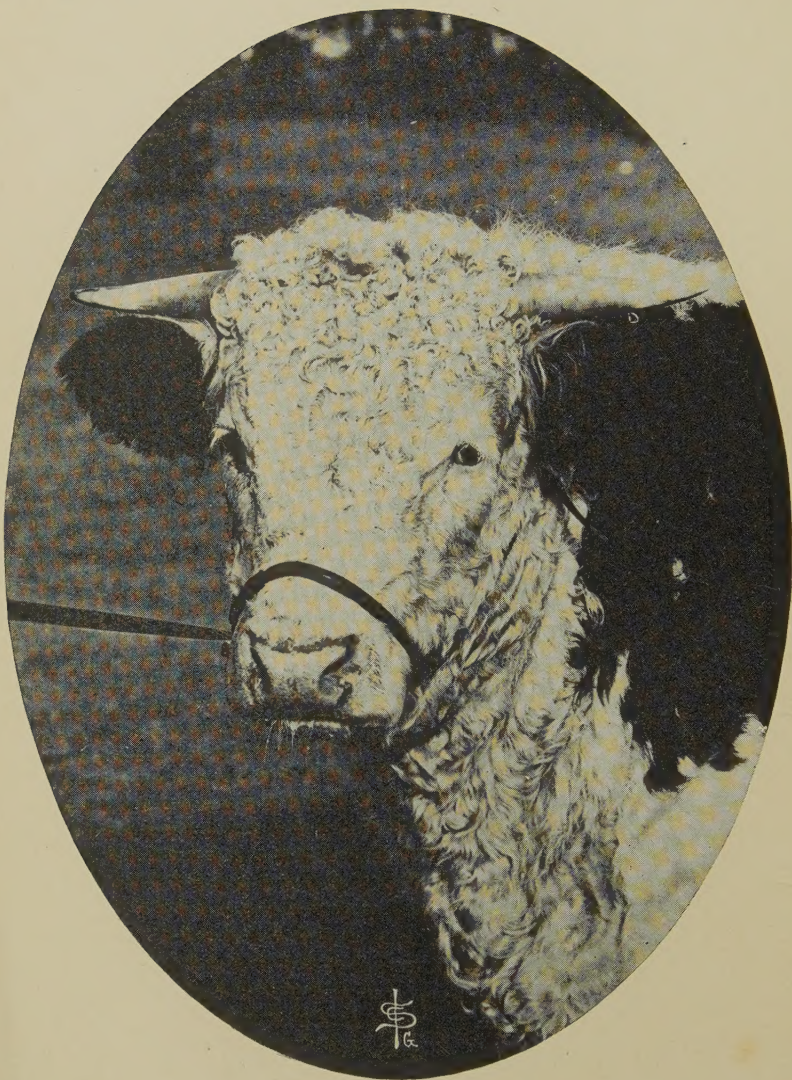
INSTITUTE OF FOOD AND
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UNIVERSITY OF FLORIDA

Gainesville



Page 123



An Ideal Feeder's Head

Hereford steer, Peerless Wilton 39th's Defender, grand champion at the
International Live Stock Show in 1906. Bred and fitted
by H. J. Fluck, Goodenow, Ill. Sold to
Iowa State College.

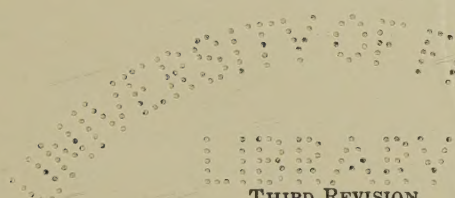
TYPES AND MARKET CLASSES OF LIVE STOCK

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BY

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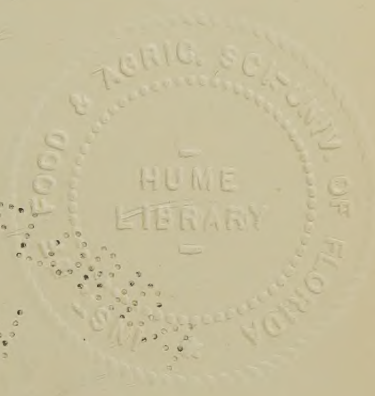
THIRD REVISION

SIXTEENTH EDITION

R. G. ADAMS & COMPANY

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PREFACE

At most agricultural colleges, the study of beef cattle begins with the fat steer at the market, both on foot and in the carcass, proceeds from that to a study of cattle in the feed-lot, and then considers the selection and operation of the breeding herd. Similar procedures are followed in studying other kinds of live stock. If the student learns his first lesson at the market, he comes to the feed-lot fortified with a knowledge of what the market wants, and he then proceeds to a study of the breeding herd knowing what both the market and the feed-lot demand from the breeder.

This is the most practical method of teaching because the market should serve as a guide to the breeder and feeder; and it is best from a pedagogical standpoint because finished animals for the market are easiest to judge, are judged on practical points, the student begins his judging with the more elementary and proceeds to the more complex types, and as he progresses to each new stage he brings with him a soundly practical viewpoint gained from his previous experience. Finally, in his study of the commercial breeding herd, the produce of which goes direct to the feed-lot or market, he learns the necessity for using good purebred sires, and this leads in logical order to the study of the breeds of farm animals. He takes up the breed studies with a clear understanding that it is the function of these breeds to supply seed to improve all farm and range live stock, he has a firm belief in their power to perform this function, and he is led to compare and value the various breeds as they should be compared and valued, namely on their ability to meet practical requirements. In short, the modern plan of study, which proceeds from the market to the breeds, rather than from the breeds to the market, gives the student the right philosophy of the live-stock business, particularly the purebred live-stock business.

In the first edition of this book, published in 1915, the undersigned endeavored to present clearly and concisely the things a beginner in the field of animal husbandry should know, leading up to, but not including, the study of the breeds. In the revised editions published in 1919 and 1923, and in this, the third revised edition, the objective has been the same as in 1915. Part of the text matter has been rewritten, the live-stock statistics contained in the book have been brought down to date, and a number of new illustrations have been added. Many of the illustrations which ap-

pear in the following pages have been kindly supplied by authors of experiment station and other publications, teachers, breeders, breed record associations, and others. Individual mention of these is made in the list of illustrations, beginning on page 11. In this list credit is also given for illustrations which originally appeared in other publications and which are reproduced herein with the permission of the authors or publishers.

The writer gratefully acknowledges his indebtedness to many teachers, experiment station workers, members of staffs of the Bureaus of Animal Industry, Dairy Industry, and Agricultural Economics of the United States Department of Agriculture, packing companies, breeders, feeders, commission men, market reporters, and others who have rendered assistance in the preparation of this book.

Bozeman, Montana
July, 1930

H. W. VAUGHAN

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TYPES AND MARKET CLASSES OF LIVE STOCK

GENERAL INTRODUCTION

Two distinct systems of farming are practiced in the United States: (1) grain farming and (2) live-stock farming. Grain farming is the growing of crops useful for food or clothing, the income being derived from the sale of these crops. Live-stock farming is that system in which the crops are used chiefly or entirely as feed for the live stock which is produced, the income being derived from the sale of animals, milk, and wool.

Live stock farming requires greater skill.—Of the two systems, live-stock farming affords much greater opportunity for the development and application of knowledge and skill. The live-stock farmer must be equally competent as a crop producer with the grain farmer, and in addition must know how to handle and feed live stock economically. He must have a certain practical knowledge of animals and their requirements which comes with experience and which can be readily acquired by one who has a liking for farm animals.

Ample reward for greater skill.—Dr. C. E. Thorne of the Ohio Experiment Station has said, "While it is true that meat is an extravagantly wasteful food, viewed solely from the economic standpoint, yet it is also true that the ruling peoples of the earth are the meat eaters, and the time is probably far in the future when in this country meat will be banished from the tables of any but the improvident, even though further advance in its cost should take place. The outlook, therefore, is that for a long time to come the farmer who possesses the ability to handle live stock successfully will find ample opportunity for the exercise of his talents and ample reward for the larger ability which such exercise involves."

Live stock converts farm wastes into profits.—The keeping of live stock on the farm provides a means of utilizing as feed or bedding much that would otherwise be wasted. This applies to large amounts of roughage such as straw and corn stalks. Meadow

aftermath and rough, stony, or semi-arid land unsuited for the plow may be grazed, unmarketable soft corn may be fed, and other similar wastes may be converted into profits where live stock is kept.

Live stock and soil fertility.—The maintenance of soil fertility is more difficult under the grain-farming system. Although it has been experimentally demonstrated that fertility may be maintained and increased by the use of commercial fertilizers and green manures without the aid of live stock, nevertheless the keeping of live stock and the utilization of farm manure afford the easiest method of maintaining and increasing the fertility of the soil. Where farming has been practiced for a long period of time, the most fertile and prosperous communities are those in which much live stock has been kept and the manure properly handled and applied to the soil.



FIG. 1.—Rough, stony, or semi-arid land unsuited to the plow may be utilized as pasture.

A comparison of crop yields during five years on ten beef cattle farms in ten counties in Iowa, and on ten grain farms in the same neighborhoods, showed that the cattle farms averaged 14 bushels more corn per acre, 7 bushels more oats, and 1 ton more hay.

Value of farm manures.—Experiments indicate that if animals were kept in stalls or pens throughout the year and the manure carefully saved, the approximate value of the manure produced by each horse or mule would be \$27, by each head of cattle \$20, by each hog \$4, and by each sheep \$2. The total fertilizing value of the manure produced in the United States in one year would, there-

fore, be \$2,112,847,000. In this estimate, no account is taken of the value of the manure for improving the mechanical condition and drainage of soils, which is fully as great as the value of the phosphoric acid, potash, and nitrogen contained in farm manure.

Saves four-fifths of fertilizing value of crops fed.—When fed to animals, a large proportion (about 80 per cent) of the fertilizing element of the feed is recovered in the excrement. For example, if a ton of corn is sold off the farm, it removes fertility to the value of \$6.56; while if fed to animals, this ton of corn results in manure worth, while fresh, \$5.24. If manure is properly handled and applied to the soil, little of its fertilizing value will be lost. The corresponding figures for one ton of oats are \$7.43 and \$5.94 respectively, for timothy \$5.21 and \$4.16, red clover \$8.79 and \$7.03, alfalfa \$8.76 and \$7.00, oat straw \$3.30 and \$2.64, corn silage \$1.22 and \$0.97, whole milk \$1.96 and \$1.52.

Purchased feeds increase soil fertility.—In many instances the best method of increasing the fertility of a farm is to buy feeds which may be fed profitably to the live stock on hand, and then carefully handle and apply the manure produced. For example, a ton of cottonseed meal or wheat bran used for feed gives manure worth, while fresh, \$19.20 and \$10.19 respectively.

Farm animals convert crops into products of greater value.—The live-stock farmer who fails to conserve and utilize farm manures is surely overlooking a great source of profit. On the other hand, animals should not be regarded merely as fertilizer factories. The manure produced by farm stock, while valuable, is secondary in importance to the value of the animals themselves. Farm animals are valued primarily for their meat, milk, wool, labor, fats, and hides. *The stockman converts his crops into animal products of higher value to man*, aiming thereby to reap a larger profit than is possible by the grain-farming system, and at the same time he increases the fertility of his land.

O. E. Baker of the U. S. Bureau of Agricultural Economics states¹ that fully 60 per cent of the crop acreage in the United States, exclusive of pasture, is used to produce feed for farm animals, and that fully 80 per cent of the total food and feed produced by all tame and wild vegetation in the United States is consumed by live stock. The latter statement includes cereal crops, improved and unimproved pastures in farms, woodland pastures in farms and national forests, and arid or semi-arid open range land in the West.

¹ A Graphic Summary of American Agriculture, U. S. Dept. Agr. Year-book, 1921, p. 409.

Advantages of live-stock farming summarized:

1. Live-stock production, properly conducted, is a profitable business.

2. It provides a home market and pays better than average prices for farm crops.

3. Makes easily possible the maintenance and improvement of soil fertility.

4. Gives steady employment throughout the year to labor on the farm and thereby helps to solve the farm labor problem.

5. Utilizes as pasture much land unfit for the plow.

6. Utilizes much that would otherwise be waste on the farm, such as straw, corn stalks, soft corn and other unsaleable grain, meadow aftermath, many weeds, and garbage.

7. Affords the best means of utilizing such by-products as tankage, cottonseed meal, linseed meal, gluten feed, and skim milk.

8. Affords opportunity for higher development and application of skill in farming.

9. The care and handling of live stock is intensely interesting work.

Numbers and values of our live stock.—The U. S. Department of Agriculture reports the numbers and values of live stock on farms in the United States on January 1, 1930, as follows:

	Number	Total value	Value per head
Horses	13,440,000	\$950,318,000	\$70.71
Mules	5,322,000	441,726,000	83.00
Milk cows	22,499,000	1,876,357,000	83.40
Other cattle	35,468,000	1,443,747,000	40.71
Sheep	48,913,000	435,515,000	8.90
Swine	52,600,000	717,306,000	13.64
Totals	178,242,000	\$5,864,969,000	

Rank of the states in cash income from live stock.—Following are the total cash incomes of each of the 48 states from the sale of cattle, hogs, sheep, horses, mules, milk, wool, mohair, chickens, eggs, and bee products during the year 1928, as estimated by the U. S. Department of Agriculture:

	Millions of dollars		Millions of dollars
1. Iowa	515	11. California	185
2. Wisconsin	311	12. Texas	180
3. Illinois	299	13. Pennsylvania	179
4. Minnesota	297	14. Michigan	158
5. Nebraska	271	15. South Dakota	143
6. Missouri	251	16. Oklahoma	93
7. New York	237	17. Colorado	78
8. Ohio	229	18. Kentucky	74
9. Kansas	214	19. Montana	68
10. Indiana	205	20. North Dakota	68

21. Washington	68	36. Arkansas	29
22. Oregon	65	37. Connecticut	29
23. Tennessee	57	38. Mississippi	28
24. Idaho	54	39. Arizona	28
25. Virginia	53	40. Maine	24
26. Wyoming	44	41. Alabama	19
27. New Jersey	42	42. New Hampshire	17
28. New Mexico	39	43. Nevada	17
29. Utah	38	44. Florida	16
30. Vermont	37	45. Louisiana	15
31. Maryland	36	46. South Carolina	10
32. West Virginia	36	47. Delaware	8
33. Massachusetts	35	48. Rhode Island	6
34. North Carolina	33		
35. Georgia	31	Total	4,970

Growth of American live-stock industry in 60 years.—The following census returns show the growth in numbers of our live-stock industry since 1870:

Numbers (millions) of animals on farms in the United States on census dates

	1930 ¹ (Jan. 1)	1920 (Jan. 1)	1910 (Apr. 15)	1900 (June 1)	1890 (June 1)	1880 (June 1)	1870 (June 1)
Horses	13	20	20	18	15	10	7
Mules	5	5	4	3	2	2	1
Milk cows	22	24	21	17	17	12	9
Other cattle	35	43	41	50	34	22	14
Sheep	49	35	52	62	36	35	28
Swine	53	59	58	63	57	48	25

¹ Estimated by U. S. Department of Agriculture.

The United States leads all other countries in the production of live stock. Though excelled by India and Russia in total number of cattle, the United States leads all countries in beef production. We also rank first in the production of milk, butter, and cheese. We rank second among all countries in number of hogs, being surpassed by China, but we surpass China in number of hogs per capita. We rank third in number of sheep, being surpassed by Russia and Australia in the order named. We rank second to Russia in number of horses. We far surpass any other country in number of mules, with more than four times as many as Spain, our nearest competitor. No other country equals the United States in livestock production of all kinds, particularly if both numbers and quality of live stock are taken into consideration.

With about 6 per cent of the world's population and 5.7 per cent of the total land area, we have 9 per cent of the world's cattle, 20 per cent of the hogs, 8 per cent of the sheep, 21 per cent of the horses, and 62 per cent of the mules. We produce 65 per cent of the world's corn, 29 per cent of the oats, and 18 per cent of the barley. Most of these cereals is fed to live stock. We lead all countries in the production of corn, barley, and oats.¹ Our tremendous

¹ We also lead in wheat, cotton, and tobacco.

advantage in corn production explains our supremacy in pork production, and also largely explains our high rank in beef production. Corn and grass are the basic meat-producing materials in America. Corn is, in fact, the principal grain feed in this country for all kinds of farm animals. "Corn is the great energizing, heat-giving, fat-furnishing food for the animals of the farm. No other cereal yields, on a given space and with a given expenditure of labor, so much animal food in both grain and forage. On millions of farms successful animal husbandry rests upon this imperial grain and forage plant."¹

Meat export countries.—The export trade of the meat-surplus countries amounts to less than 8 per cent of the entire production of the world.² Over 92 per cent of the world's meat production is consumed in the countries in which it is produced. The principal meat export countries are Argentina, United States, Denmark, Netherlands, New Zealand, Uruguay, and Australia. Argentina largely dominates the world's beef export trade. The United States contributes the great bulk of export pork products. Mutton exports originate almost entirely in New Zealand, Argentina, Australia, and Uruguay. Denmark and Canada export considerable high-class bacon, and Uruguay, Australia, Netherlands, and New Zealand make contributions to beef exports.

Meat import countries.—Great Britain is far in the lead as a meat-importing country, consuming more than half of the total of all meat and meat products imported by the 19 principal meat-importing countries of the world. Germany holds second place, and France ranks third. Other meat-importing nations are Austria, Belgium, Cuba, Netherlands, Czechoslovakia, Poland, Italy, Norway, Sweden, Spain, and Switzerland. Imports of live animals are relatively small and consist largely of shipments across boundaries to nearby markets.

The "meat eaters."—Half of the people of the world eat little meat. Meat is consumed in greatest amounts per capita in the countries named in the two preceding paragraphs, to which may be added Russia, Greece, and Portugal. The annual per capita consumption ranges from over 300 pounds in Argentina and over 200 pounds in Australia and New Zealand to about 40 pounds in Portugal. Canada ranks fourth with 156 pounds, and the United States ranks fifth with about 153 pounds, of which 15 pounds is lard.

¹ Henry and Morrison: Feeds and Feeding, 1915, p. 149.

² George K. Holmes: Meat Situation in the United States, U. S. Dept. Agr. Rpt. 109, p. 97.

Brief survey of North American live-stock industry.—The foremost live-stock producing region in the United States and in the world is the corn-belt region of the Central West, including the seven states, Iowa, Illinois, Nebraska, Missouri, Kansas, Indiana, and Ohio, and parts of South Dakota, Minnesota, Wisconsin, Michigan, Oklahoma, Kentucky, and Tennessee. This region leads all others in beef production and pork production, holds a prominent place in dairying, has about half of the horses of the country, and produces over 70 per cent of the mules. Many cattle and sheep are brought here for feeding. The fattening of meat animals on grain rations is largely confined to this area. Most of the large live-stock markets of the United States are located within the corn belt.

The western range region, including all territory west of the Missouri river, enjoys special advantages in extensive areas of cheap pasture lands, leads in mutton and wool production, produces a large quantity of beef, and supplies the corn belt with large numbers of feeder steers and feeder lambs. With the exception of the Pacific coast region, the western range states raise comparatively few dairy cattle and hogs.

In the Great Lakes and Appalachian region, including New York, Pennsylvania, Michigan, Wisconsin, Minnesota, and the New England states, the breeding of dairy cattle and production of dairy products is practiced on an extensive scale.

The cotton-belt region of the South, extending from central Texas to the Atlantic coast and from the corn belt to the Gulf coast, has given attention during recent years to improvement in live stock and to increased production, particularly with cattle and hogs. Texas has long been noted as the foremost beef cattle breeding ground, and ranks first among all states in numbers of beef cattle and sheep. Georgia has attained considerable prominence in the production of pork. In the cotton belt the mule is the favorite work animal, though most of the mules used in this region are produced in states north of the cotton belt. Eleven southern states have more mules than horses.

Canada, with about 0.5 per cent of the world's population and 6.9 per cent of the land area, has 3.8 per cent of the world's horses, 1.7 per cent of the hogs, 1.4 per cent of the cattle and 0.6 per cent of the sheep.¹ Among 90 countries for which statistics are available, Canada ranks 7th in horses, 10th in hogs, 13th in cattle, and 31st in sheep. Bacon-type hogs are produced extensively. Ontario and Quebec far surpass the other Canadian provinces in numbers of swine and are also outstanding in numbers of dairy cows. On-

¹ U. S. Dept. Agr. Yearbook, 1930.

tario is far in the lead in cattle other than dairy cows, with Quebec and Alberta second and third. Many communities in Canada, especially in Ontario, are noted for high average excellence of all kinds of farm live stock. In 1929 Canada is reported to have had 8,931,000 cattle, 3,728,000 sheep, and 4,382,000 hogs.¹

Mexico is a country with great possibilities in live-stock production which may be realized at some future time if long-continued warfare gives way to peace and industry. Much of the area of Mexico is elevated above the tick line and formerly many millions of cattle were produced, especially in the northern states. In 1926 Mexico is reported to have had 5,585,000 cattle, 2,698,000 sheep, and 2,903,000 hogs.¹

The stockman's success depends very largely upon the degree to which his animals meet with favor on the live-stock market. If he is to make a financial success of his business, he must produce what the market wants. Far too many feeders of live stock lack acquaintance with market demands. Far too many breeders devote themselves to a breed simply because it satisfies a hobby and because the breed appeals to their fancy, rather than because they see in their animals any special utility. Unless a breed of beef cattle makes possible the production of better beef for the market; unless a breed of swine is fostered because in it is seen the possibility of improving the quality or cheapening the cost of pork; unless a breed of draft horses is really useful when put to the test in the collar; then such breeds have little excuse for their existence, and those who foster them must sooner or later suffer financially for their efforts. Both the breeder and the feeder must know the demands of the open market and keep them always in mind.

The great live-stock breeders of the past were intensely practical; they never overlooked the market requirements of the kind of animals they bred. No animal met with favor in their eyes unless such favor was earned by meat upon the back, milk in the pail, weight and quality of wool, pounds gained for pounds of feed consumed, or some other performance of practical value. With them it was a question of ultimately furnishing better animals for the market or lowering the cost of production. It must be just so with the master breeders of the present and future.

These pages aim to familiarize the reader with the types of farm animals, market demands, and market classes of live stock, such knowledge being fundamental in all live-stock work and study, and valuable not only to breeders and feeders, but to all persons who buy and use animals.

¹ U. S. Dept. Agr. Yearbook, 1930.

PART I---CATTLE

INTRODUCTION

"The cow is the most essential of all man's four-footed friends. Strike beef and milk, cream and butter from the human dietary, and you have dealt a blow at civilization itself. Banish cattle from the grazing grounds of the temperate zones, and you have obliterated one of the world's chief sources of wealth. Eliminate the herds from the pastures of both hemispheres, and you are on the road to a paralyzing lost fertility. Drive cattle from the ranges of North and South America, and you have turned back millions of semi-arid acres into a wilderness more or less abandoned of God and man."—Alvin H. Sanders in the Breeder's Gazette.¹

The United States leads all other countries in the production of beef and dairy products. Formerly we produced a considerable surplus of beef, butter, and cheese which we exported to the value of many millions of dollars annually, but these exports have declined to a marked degree, and though greatly revived during the World War, they have again sharply declined. Imports of these products have increased. Note the following table:²

Imports and exports of beef and dairy products

	Imports	Exports
Cattle—Number:		
1900	181,006	397,286
1929	566,000	7,531
Beef—Pounds: ¹		
1900	2,500,000	857,542,000
1929	62,481,000	101,334,000
Butter—Pounds:		
1880	487,120	39,236,658
1929	3,298,000	3,778,000
Cheese—Pounds:		
1880	2,737,186	127,553,907
1929	84,606,000	2,572,000

¹ Includes veal and edible offal.

The decline in our beef and dairy exports is chiefly due to a population increasing at such a rapid rate that the increase in home production of food does not keep parallel with it. The United States had 7 millions of people in 1810, 17 millions in 1840, 39 millions in 1870, 76 millions in 1900, 92 millions in 1910, 106 millions

¹ Nov. 30, 1922, p. 721.

² Compiled from U. S. Dept. Agr. Yearbooks; Handbook of Dairy Statistics, 1928.

in 1920, and 119 millions in 1928. Furthermore, only 26.3 per cent of the population having census occupations is agricultural, and the percentage declined from 83 per cent in 1820 to 77.5 per cent in 1840, 47 in 1870, 35 in 1900, and 33.1 in 1910. The consumers of food-stuffs in America have increased at a much more rapid rate than the producers.

The special advantages of cattle as compared to other kinds of live stock on the farm may be noted as follows:

1. Cattle consume larger quantities and make more efficient use of coarse and low-grade roughages produced on the farm, such as coarse hay and corn stalks and the coarser pastures of ranker growth. No other farm animal will utilize so much of what otherwise would be waste on the farm.

2. Cattle can use the total production of grains and roughages on the average farm, with or without the purchase of other feeds, more efficiently than any other kind of live stock.

3. Cattle can be used profitably on low, wet land unsuited for crops or for other kinds of live stock. Cattle also approach sheep in adaptability to arid or rough land not suited to crop production.

4. Cattle on the farm greatly help to equalize the distribution of farm labor throughout the year. Excepting cows that are milked, cattle require little attention during the summer and fall pasture season when crops need attention. During winter and early spring, farmers can employ their time to advantage in caring for the breeding herd, wintering stockers, or fattening steers.

5. Cattle products are less subject to seasonal fluctuations in supply and price than those of any other kind of live stock.

6. Beef cattle require less labor for their care than do other farm animals.

7. Dairy products remove less fertility from the farm than do other major farm products.

The three types of cattle.—Experience has shown that only a certain kind or type of cow can produce a large flow of milk, and that quite a different kind or type is necessary for efficient beef production. The high-class dairy cow possesses certain well-marked characters which make her useful as a machine for producing milk, and we call this combination of characters *dairy type*. Likewise, the high-class beef animal has certain well-marked characters which indicate efficiency in converting feed into flesh rather than into milk, and we call this combination of characters *beef type*. Some breeders have endeavored to establish what is called a *dual-purpose type* of cattle. They believe there is need of a cow

that can produce both beef and milk, and they have, therefore, tried to combine dairy type and beef type as nearly as possible. The dual-purpose cow does not give as much milk as the dairy cow, nor does she make as much beef as the beef cow. At present the demand for dual-purpose cattle is comparatively limited, but some authorities have predicted that many farms will ultimately adopt the dual-purpose type as the one most profitable.

Definition of type.—A type is an ideal or standard of perfection combining all the characters which contribute to the animal's value and efficiency for the purpose specified. Type provides the animal with the proper form and structure for the kind of work or production desired. For example, if the specified purpose is beef production, then a rectangular, broad-topped form and abundant muscling are among the more important characters necessary to successful production. If the specified purpose is milk production, then a wedge-shaped, angular form and a large udder are among the important essentials. In both the beef animal and the dairy animal, a straight, strong back contributes to the value of the animal, though it may or may not contribute to the animal's efficiency in production.

The breeds of cattle.—Various breeds of cattle have been evolved to meet the demands for each of the three types of cattle. Each breed has its distinctive and special features not found in individuals of other breeds. These special characters constitute what is called the *breed type*. For example, there are six breeds of beef cattle all of which possess beef type, yet each breed is distinctive in certain points which make up the breed type.

Years ago, various groups of men in different localities under different conditions and with different sorts of unimproved cattle took up beef production, or dairying, or a combination of the two. In this way originated the various breeds of the three types of cattle as we know them today. Competition does not narrow each type down to a single best breed, because no one breed is best under all conditions of soil, climate, and feed supply.

The classification of the breeds according to type, and the number of registered purebreds of each breed in the United States, as shown by the 1920 census, are as follows:

Type	Breed	Number
BEEF TYPE.....	{ Shorthorn	416,995
	{ Hereford	405,582
	{ Aberdeen-Angus	108,524
	{ Polled Shorthorn	61,764
	{ Polled Hereford	(*)
	{ Galloway	7,225
	All other ¹	63,409
	Total	1,063,499
DAIRY TYPE.....	{ Holstein-Friesian	528,621
	{ Jersey	231,834
	{ Guernsey	79,446
	{ Ayrshire	30,509
	{ Brown Swiss	8,283
	All other ²	37,909
	Total	916,602
DUAL-PURPOSE TYPE..	{ Red Polled ³	(*)
	{ Milking Shorthorn	(*)
	{ Devon	1,413
	All breeds	1,981,514

¹ Probably includes Polled Herefords and some Red Polled.

² Includes Dutch Belted, French Canadian, and Kerry, and may include Milking Shorthorns, Polled Jerseys, and some Red Polled.

³ The 1920 census did not make a separate count of Red Polled cattle, but they are much more numerous than Milking Shorthorns or Devons.

⁴ Not separately reported.

Definitions of Cattle Terms

Bull.—Breeding male, any age.

Cow.—Mature female.

Heifer.—A female under three years old, and usually one that has not produced offspring.

Calf.—Young animal, usually under one year old.

Steer.—Unsexed male, castrated when a calf. The best age to castrate calves is six to eight weeks old, although they may be castrated from a week to six months old. The longer castration is delayed the greater is the risk of loss from the operation and the greater the liability of coarseness developing in head, neck, and forequarters.

Stag.—Unsexed male, castrated when mature or so far advanced toward maturity that masculinity is plainly evident in head, neck, and forequarters. Well-developed masculine character constitutes coarseness in a market animal.

Spayed heifer.—Unsexed heifer. Spaying is performed by making an incision in front of the left hip and removing the ovaries. The scar left after the operation is about the only sure method of identifying such heifers.

Free-martin.—An imperfectly-sexed heifer born twin with a

bull. They are infertile. All heifers born twin with bulls are not free-martins.

Polled.—Naturally hornless. The Aberdeen-Angus, Galloway, and Red Polled breeds are polled and produce polled offspring. The Polled Shorthorn and Polled Hereford breeds are polled and usually produce polled offspring. The term "mulley" is sometimes applied to polled cattle, more especially to those not representative of any particular breed.

Scurs.—Flat or rounded buttons of horns sometimes present on the heads of polled animals and usually attached to the skin rather than to the skull.

Dehorned.—Made hornless by the application of caustic potash which destroys the horn-forming tissue of the young calf before the horns have appeared, or by clipping or sawing off the horns of older animals. The former method, properly practiced, is simpler, easier, safer, and gives a neater appearance.

Show Yard Classification by Ages

Beef cattle.—The base dates for classifying beef cattle by ages are January 1, May 1, and September 1, and the classes by ages are as follows:

Junior calf class.—The animals eligible to this class are those calved on or after January 1 of the year shown.

Senior calf class.—Calved September 1 to December 31 of the preceding year.

Summer yearling class.—Calved May 1 to August 31 of the preceding year.

Junior yearling class.—Calved January 1 to April 30 of the preceding year.

Senior yearling class.—Calved May 1 to December 31 of the second preceding year.

Two-year-old class.—Calved May 1 of third preceding year to April 30 of second preceding year.

Aged class.—Calved before May 1 of third preceding year.

For example, during the fall and winter show season of 1930, junior calves are those calved on or after January 1, 1930; senior calves, those calved from September 1 to December 31, 1929; summer yearlings, from May 1 to August 31, 1929; junior yearlings, from January 1 to April 30, 1929; senior yearlings, May 1 to December 31, 1928; two-year-olds, May 1, 1927, to April 30, 1928; aged animals, calved prior to May 1, 1927.

Junior champion.—Best animal calved on or after January 1 of the preceding year.

Senior champion.—Best animal calved prior to January 1 of the preceding year.

Champion.—Best animal any age.

Grand champion.—Best animal any age or breed. The term “grand champion” is also frequently applied to champions.

Dairy cattle.—The base dates for classifying dairy cattle by ages for show are February 1 and August 1. Classes are provided for calves, junior and senior yearlings, two-year-olds, and aged animals. Many shows also provide a separate class for three-year-old cows, and some of the larger shows also provide a separate class for four-year-old cows. Where this is done, the aged cow class consists of animals over three or over four years of age, as the case may be.

Dual-purpose cattle.—Milking Shorthorns and Red Polled cattle have January 1 and August 1 as base dates for show classification.

CHAPTER I

BEEF TYPE

The following description applies particularly to the fattened steer. Special or additional features of type which should characterize the beef bull and the beef cow will receive attention in another chapter. It should be understood, however, that all good beef animals—steers, heifers, cows, and bulls—are similar in the essentials of beef type; therefore, the description given here applies in most respects to all classes of beef animals.

General appearance.—When correct in form and fatness, the beef animal presents a massive, blocky appearance from every angle of view. As viewed from the side, the body is rectangular, very deep, and short from shoulder to hip. The body is very wide, and the legs are short and placed squarely under the body. Two dimensions of the beef animal should be great—width and depth; the third dimension, length, should be relatively small. There should be great smoothness of outline everywhere, all the parts being uniformly developed and so blended as to form a symmetrical and balanced animal. Along the top, the ideal animal is uniformly broad, the more width the better. From a side view, the top line and underline are straight and parallel. A fullness of outline is presented everywhere.

An animal showing too much length of middle is referred to as “rangy,” while animals standing high off the ground on long legs are termed “leggy.” The head should be short and broad, and the neck short and thick. Such a head and neck are associated or correlated with the desired type of body. Rangy, leggy animals usually have long, narrow heads and long, thin necks. With only the heads and necks of a number of beef animals in view, the best animals may be picked out with reasonable certainty by the general proportions of the heads and necks. A straight-edge laid against the side of a beef animal should touch the shoulder and hindquarter and all points between them.

The head should be of medium size, short, and broad, with a broad muzzle, indicating capacity for grazing and feeding. The nostrils should be large, indicating capacity for breathing and hence a good constitution. The face should be short and from a side view the line of the face should be straight or show a slight inward curve or dish from eyes to muzzle. The eyes should be wide

apart, large, prominent, bright, clear, and indicative of a quiet disposition. A quiet expression of the eyes means a quiet, contented feeder that will transform feed into flesh; a nervous, restless expression is evidence of an unsatisfactory feeder that will neither consume enough feed nor store up the energy of the feed consumed, but waste it in nervousness and too much moving about. The forehead should be wide. The jaws should be broad and well muscled. If horns are present they should not be heavy and coarse, but of medium size and of good shape and proportions, tapering evenly to their tips. The ears should be of medium size and fine texture. The entire head should be clean-cut, all lines being sharply defined, giving a well-bred appearance, sometimes referred to as "character."

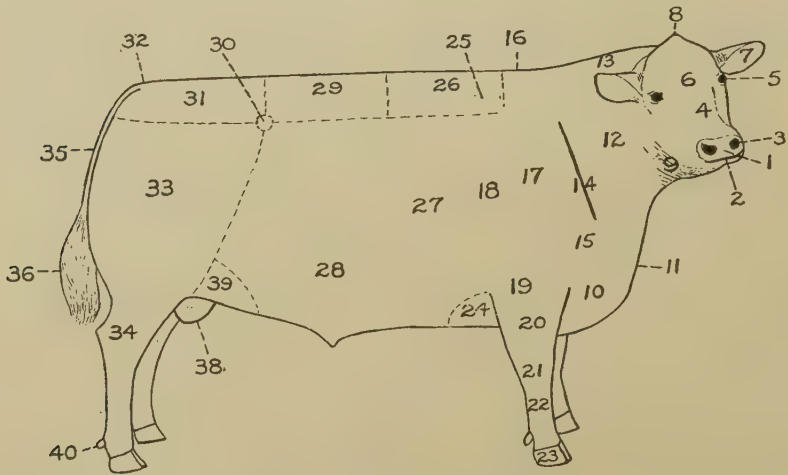


FIG. 2.—Points of the steer.

- | | | | |
|----------------|-----------------------|-----------------------|------------------|
| 1. Muzzle | 11. Dewlap | 21. Knee | ✓ 31. Rump |
| 2. Mouth | 12. Neck | 22. Shank | ✓ 32. Tail-head |
| 3. Nostril | 13. Crest | 23. Foot | ✓ 33. Thigh |
| 4. Face | 14. Shoulder vein | ✓ 24. Fore flank | ✓ 34. Hock |
| 5. Eye | 15. Point of shoulder | 25. Crops | 35. Tail |
| 6. Forehead | 16. Top of shoulders | ✓ 26. Back | 36. Switch |
| 7. Ear | 17. Shoulder | ✓ 27. Ribs | 38. Cod |
| 8. Poll | 18. Fore-rib | ✓ 28. Paunch or belly | ✓ 39. Hind flank |
| 9. Tongue root | 19. Elbow | ✓ 29. Loin | 40. Dew claw |
| ✓ 10. Brisket | 20. Arm | 30. Hip or hook | |

The neck should be short, thick, and muscular. The throat should be neat and trim, while at the shoulders the neck should show depth and fullness. The line where the neck and shoulder join is called the "shoulder vein," and we like this part to be filled out plump and full. A long neck lacking in thickness is frequently found, and it is undesirable chiefly because it is associated with a

rangy type of body. When the animal is standing in natural position, with the head up, the top line of the neck should be slightly arched and the poll of the head should be slightly higher than the top of the shoulders.

The **shoulders** should be very smooth, blending perfectly with the rest of the body. This conformation is secured when the shoulder blade lies snugly against the ribs beneath, and is covered over with a uniformly thick layer of flesh. The top of the shoulders should not be sharp and fine, nor yet so wide that the tops of the shoulder blades are prominent and outstanding, but should be moderately wide and nicely rounded over with flesh. Rough, angular shoulders, unevenly covered, are among the most common defects of beef cattle. When the shoulders are not properly laid in, but are wide and open, the appearance of the animal is injured, the flesh-

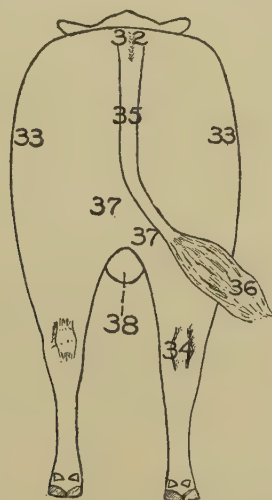


FIG. 3.—Points of the steer.

32. Tail-head

33. Thighs

34. Hocks

35. Tail

36. Switch

37. Twist

38. Cod

ing over the shoulder is not taken on properly, and, when slaughtered, the carcass lacks the smooth, tidy appearance so much desired. A prominent shoulder also causes the development behind it to appear insufficient.

The **brisket** and **chest** are highly important. The former should carry forward prominent and wide, and be well fleshed, yet neat, presenting a full, well-developed, and trim appearance. The chest, which lies between the shoulders and immediately behind them, ought to be very wide and deep. Too much width and depth are never found. A full, deep chest with large heart-girth indicates

a rugged sort of animal possessed of much constitutional vigor. The floor of the chest should be wide, as shown by the distance between the two fore legs, provided width at this point is not due merely to prominent, open shoulders which set the fore legs wide apart. The fore-rib, lying just behind the shoulder, should not be flat, but should arch boldly so that no flatness or depression exists immediately behind the shoulder. Many beef animals present a hollowness or flatness of fore-rib which detracts much from the desired smoothness and evenness of conformation, and reduces the chest capacity. Care should be taken to see that the animal carries down deep and full at the front flanks just behind the



FIG. 4.—A model bullock. Black Ruler, Aberdeen-Angus senior yearling steer, grand champion at the 1920 International Live Stock Show. Bred, fed, and shown by Purdue University. Weight 1,340 pounds. Sold for \$1.75 per pound. Note his rectangular and blocky form, short legs, and the wealth of flesh spread evenly over all parts. Note the good head, short neck, neat brisket, full shoulder vein, smooth shoulder, deep rib, excellent quality, and stylish appearance.

elbows. The butcher cares nothing for a beef animal's constitution, but every intelligent feeder places great emphasis on the depth and width of chest, which indicate to him that the steer will be a good doer in the feed-lot. Briefly summing up these points, we may say that the forequarters should be smoothly laid,

smoothly and thickly fleshed, and very wide and deep, showing no lack of constitution anywhere.

The **front legs** should be short and placed squarely under the animal. They should come straight down, and the toes should point straight forward. For reasons already given, the fore legs should be set well apart. The arm should be wide and muscular at its attachment to the shoulder. Refinement of bone and cleanliness of joints are evidences of quality, whereas rough, coarse animals have heavy joints and big shank bones.

The **back** carries great weight, and it is desirable that it be straight and strong. When some people refer to the back they in-



FIG. 5.—The right pattern. Chenoweth Jock, Shorthorn senior steer calf, grand champion at the 1922 International Show. Bred, fed, and shown by W. J. and B. A. Thomas, Shelbyville, Ky. Weight 1,010 pounds. Sold for \$1.25 per pound. This calf was exceptionally good in the development of the high-priced cuts and in his form and quality. Note his blocky form, straight lines, trim middle, long level rump, broad smooth tail-head, and heavy hindquarters.

clude the entire top of the animal from shoulders to tail. Others mean the top from shoulders to hips. The score card restricts the meaning of this term to that portion of the top lying between the shoulders and the last rib, which is some distance in front of the hip. In this description we shall use the word in the score-card

sense. The back furnishes one of the high-priced cuts of beef and always receives critical attention in judging. It is important, first of all, that the back be very wide in order that it may carry the maximum amount of meat. Beef cattle are never criticized for too much width in this part. Width is secured when the ribs arch boldly from the spinal column; if the ribs are not arched, the back must necessarily be narrow.

Fully as important as the width of back is the depth of flesh which covers this part. When touched with the fingers, great depth and mellowness should be found. No mere beauty of outline



FIG. 6.—Correct type in the fat steer. Two-year-old grade Aberdeen-Angus steer, Victor, grand champion at the International Show in 1911. Fed and exhibited by Iowa State College. Weight 1,610 pounds. Sold for 90 cents per pound. Note his blocky form, straight top, deep middle, and heavy hind-quarters.

or stylishness of appearance can ever make up for lack of fleshing in a beef animal. The flesh must be there. Dimples or ties,¹ rough spots, or uneven patches of fat detract from the value because the carcass of such an animal will be rough in appearance and uneven in its covering of flesh. If a wide back furnishes greater space

¹ This refers to an adhesion of the hide to the backbone which prevents a covering of fat at that point causing a depression or dimple known as a "tie."

for meat than does a narrow one, then length of back might be advised for the same reason. But a long back is not wanted because one of the outstanding features of correct beef type is **compactness**, by which is meant shortness from head to tail, and especially shortness from shoulders to hips. We naturally expect the back to be short, because length there is associated with the undesirable rangy type of animal too often found.

The **ribs** should not only be well sprung, but they should also carry down with much depth to make a roomy or capacious body. A wide, deep middle is essential to digestive capacity. Cattle have thirteen pairs of ribs. In beef cattle they should be placed close together along the sides, and the last pair should be as close to the



FIG. 7.—A steer with excellent lines. Two-year-old grade Aberdeen-Angus steer, Blackrock, grand champion at the International Show in 1905. Fed and exhibited by Iowa State College. Weight 1,650 pounds. Sold for 25 cents per pound. This steer has straight side lines and a trim middle. He is free from paunchiness.

hips as possible. This provides a frame-work upon which the fleshing may be smoothly laid. When there is much space between the ribs, a smooth fleshing is not often found; the position of the ribs will be marked by ridges and there will be hollows between them. When the distance is great between the last rib and the hip, it is impossible to get that part filled out smoothly; instead there will be a large "hunger hollow" which detracts much from the appearance. Once more, therefore, the necessity for compactness (shortness) of middle is emphasized.

The side of the animal should be smooth and even, and the

side line should be straight from shoulder to hindquarter. The fleshing over the ribs should be thick and smooth, and the hind flank should be well filled with flesh so that when the hand is placed under it and lifted, it is found to be thick, full, and heavy. If the front and hind flanks carry down properly, the underline will be straight, as it ought to be.

At this point it is well to state that though the middle of a beef animal should be wide and deep, a distended condition of the paunch is not desirable. When this occurs, the animal is referred to as "paunchy." The lines of the middle, both at the sides and along the belly, should be straight and trim, giving a neat, tidy appearance. Given good arch and depth of rib, a steer may be straight and trim in his middle without sacrificing proper feeding capacity, and such animals suit the butcher much better than paunchy ones, because an excessive paunch means much waste when the animal is slaughtered.

The **loin** is that portion of the top lying between the back and the hips. It has no ribs below it, but consists of large muscles, affording the very choicest cuts of the entire carcass—the porterhouse and sirloin. The loin should be very wide and very thickly fleshed to afford as high development of this part as possible. The covering of flesh should also be smooth and firm. We like the loin to be thickly padded and plumped up with muscle having the proper degree of fatness. Such a loin may be described as a "live" loin—one that exhibits resiliency or springiness when handled. A loin that is flat and that handles soft and "dead" is deficient in lean meat and has too much fat. The loin-edge is sometimes rough and patchy, due to an uneven distribution of the fat, whereas it should be smooth and even.

The **hips** should be laid in snugly, and nicely covered over with flesh. The eye should not be able to locate the hip of a well-fatened animal; only when the hands are used should the point of the hip be possible of location. This helps to give the smoothness desired in both the living animal and the carcass which it ultimately yields. Wide hips cannot be covered over with flesh, and the animal has a rough and ragged appearance.

The **rump** is the top between hips and tail-head. It should be level so as to carry out the top line straight and square to the end of the body. Some animals droop in the rump, and some rise prominently; in each case the conformation is faulty. The rump should be as long as possible and as wide as the rest of the top. This permits a maximum fleshing and provides the most attractive form.

The width should be carried as uniformly as possible from hips to end of rump. As the tail-head is approached, there is bound to be some rounding off, yet this does not mean that the end of the rump need be narrow or peaked. Rather it should be wide and plumped out with flesh. Beef cattle very frequently exhibit roughness about the tail-head or at the end of the rump on each side of the tail, due to the accumulation of patches or gobs of fat. Smoothness here indicates better fleshing qualities.

The **thigh** begins at the border of the rump and extends down the outside of the leg. It should be wide and full from every angle of view, and should come down with some bulge on the outside to



FIG. 8.—A "rare good one." California Favorite, a Hereford-Shorthorn crossbred senior steer calf, grand champion at the 1916 International Show. Bred, fed, and exhibited by the University of California. Weight 1,130 pounds. Sold for \$1.75 per pound. His form, quality, and covering of flesh were almost faultless.

where the thigh naturally narrows. The fullness and thickness should carry down as close to the hock as possible. Viewed from the side, the thigh should be very wide, and when the animal is viewed from the rear there ought to be much thickness from side to side.

The **twist** is the fleshing between the hind legs, just as the

thigh includes the fleshing on the outside. It should be very deep and full, filling in the space between the legs, and carrying down as far as possible toward the hocks. The thighs and twist furnish the third most valuable cut of the carcass and are worthy of careful examination in judging.

The **hocks** and **hind legs**, by their position, indicate the capacity for fleshing in the twist and also on the thigh. If the hocks are straight and properly placed, showing no special tendency to come together, they will be associated usually with more heavily fleshed hindquarters than otherwise. It is important, therefore, that the



FIG. 9.—Exceptional in finish. Dick, Hereford summer yearling steer, grand champion at the 1928 International Live Stock Show. Fed and shown by Clarence Goecke, State Center, Iowa. Weight 1,150 pounds. Sold for \$7.00 per pound. A smooth, trim, straight lined, well finished steer. He had unusual thickness, evenness, and ripeness of flesh over all parts of the body.

hocks stand squarely under the animal. The shanks should carry straight down, and, as in front, they should be short and show refinement in bone. The joints of the leg should be clean-cut.

The **quality** of the beef animal is shown in bone, hide, hair and head. Quality, which is synonymous with refinement, is essential because it insures against coarseness of texture in all parts, especially the texture of the muscles. The head should be of medium size and should be clean-cut, presenting a chiseled appearance. The heads of many animals do not exhibit that “finishing touch” which

characterizes the head expressive of refinement. Heavy bone, large rough joints, and heavy horns show lack of quality. One of the best indications of quality is the hide, which should be found pliable, easily stretched, and only medium thick when rolled up in the hand. The hair should be soft and fine.

Quality is again shown by the smoothness of the animal, both in frame and in fleshing. Coarse shoulders, rough hips, and rough, uneven flesh show lack of quality. Quality and good breeding are usually found together, and certainly the animal with quality is the most desirable type for the producer as well as for the consumer. Well-bred animals respond best when fed out for the market. Coarse, rough animals yield unattractive carcasses and inferior cuts of meat.

Animals are sometimes found which possess too much quality. In such cases there is a delicacy of make-up; quality is purchased at the expense of constitution. Extreme quality is also purchased at the expense of size, for over-refined animals are usually undersized. The proper degree of quality represents the middle ground between two extremes, each of which is undesirable. This middle ground is difficult to define; it may be said that all the quality is wanted which may be had without sacrifice of constitution and proper size.

The **fleshing** of beef cattle is of the highest importance. The fact that the butcher's block is the ultimate end, and beef the ultimate product, must never be lost sight of by the breeder, feeder, or judge of beef cattle. All over the body, and more especially in the back, loin, and hindquarters, there should be found a uniformly deep covering of flesh. The flat of the hand pressed along the shoulder, back, or side should find a deep, mellow fleshing, without any patchiness or bare spots.

When mature cattle are heavily fed they thicken in their flesh, and this increase in thickness is due to a mixing of fat among the muscle fibers, a storing of fat between the muscles, and a laying on of fat just beneath the skin. (See Fig. 11.) When studying the fleshing of an animal it is well to keep in mind that the fleshing is made up partly of lean meat and partly of fat. The lean meat or muscle which an animal carries is often called the "natural flesh." We want as much natural flesh as it is possible to obtain. When a steer is fat it is rather difficult to determine how much natural flesh he has. In order to estimate this it is necessary to examine the development of flesh in those parts which take on very little fat, as for example the thigh, arm, and neck. Width in the crops is another good indication of heavy muscling.

The proportion of muscle in the make-up of an animal is evident at birth (see Fig. 21), and feeding will not increase it beyond a very narrow limit. Henry and Morrison of the Wisconsin Station¹ discuss this point as follows: "Since the lean-meat tissues of the body are composed mostly of muscular fibers, any gain in these tissues can be caused solely by an increase in the number or by the thickening of these fibers. The fibers increase in number by dividing lengthwise, which process occurs with farm animals only



FIG. 10.—A well balanced steer. Lucky Strike, grade Aberdeen-Angus senior steer calf, grand champion at the 1929 International Show. Fed and exhibited by Elliott Brown, Rose Hill, Iowa. Weight 950 pounds. Sold for \$8.25 per pound. He was excellent in type, lines, width, quality, smoothness, and covering of flesh.

while young and growing. Indeed, recent investigations show that with some animals all increase in the number of muscular fibers occurs before birth, the muscles of the new-born young containing as many as those of the mature animal. The fibers of the muscles can thicken to only a limited extent, and hence the muscular tissues, or lean meat, of the mature animal cannot be increased beyond a relatively narrow limit, compared with the great storage of fat which may occur."

A starving animal draws upon its muscular tissue to support life, and will rapidly repair its tissues upon a return to favorable

¹ Feeds and Feeding, 1915, p. 75.

conditions, but from the standpoint of farm and feed-lot conditions this fact ordinarily does not enter into consideration and therefore does not alter the statements which are here made. The only factors which the feeder has under his control are growth and fatness. If the animal is mature, feeding is almost exclusively a fattening process; if the animal is not mature, fattening is accompanied by growth in bone and muscle. Practically speaking, we can no more increase the proportionate amount of muscle by feeding than we can add quality, or a better head, or a straighter top line. All these are breeding problems—not feeding problems. Feeding will fatten a steer, increase his weight, and improve his form and appearance, but it has little or no effect upon the proportion of natural flesh in his make-up. The degree of fatness shown by a steer is referred to as his “condition,” and this feature will now be discussed.

Condition.—In comparison with dairy cattle, one of the most distinctive features of beef cattle is their ability to fatten easily and to deposit the fat in and around the muscles, thereby making the meat tender and juicy. As pointed out above, the feeding of beef cattle is largely a fattening process. The practical feeder knows, however, that it is not profitable to feed an animal up to its limit of fatness, because the last gains a steer makes are most costly, and such animals do not suit the consumer of beef as well as a steer fattened in moderation. Thin cattle are characterized by a very firm fleshing, so that when the finger-tips are pressed on the back and ribs the flesh is found to be hard and unyielding. When such cattle are properly fattened a decided change takes place; the flesh now has a mellow, yet firm and springy feel, and is no longer hard and unyielding. This firm, springy, and mellow condition indicates that the steer is properly fattened from a market standpoint. When feeding for show purposes, the fattening proceeds further, and, if continued to excess, the fleshing becomes soft and blubbery. To the fingers, such an animal seems incased in blubber, and when the animal is slaughtered this is indeed found to be true.

The best way to determine the state of fatness of an animal is to use the hands in the manner mentioned above. This can be done rapidly, yet thoroughly, by a vigorous handling along the top and down over the ribs and shoulders. Other means of determining the condition consist of examinations of the cod, hind flank, and tongue-root. At these points the fat tends to accumulate extensively, and they are, therefore, good indices of condition. After castration, the scrotum with its content of fat is called the “cod.” Thin steers show very little fullness of cod, while fat ones have the cod com-

pletely filled with fat. Thin animals also exhibit a very light hind flank. At the beginning there may be little more than a fold of skin; when fat, this part fills out remarkably full and heavy. By placing the flat of the hand beneath it and lifting, the quantity of fat in the flank is easily determined. When a fat steer walks, there

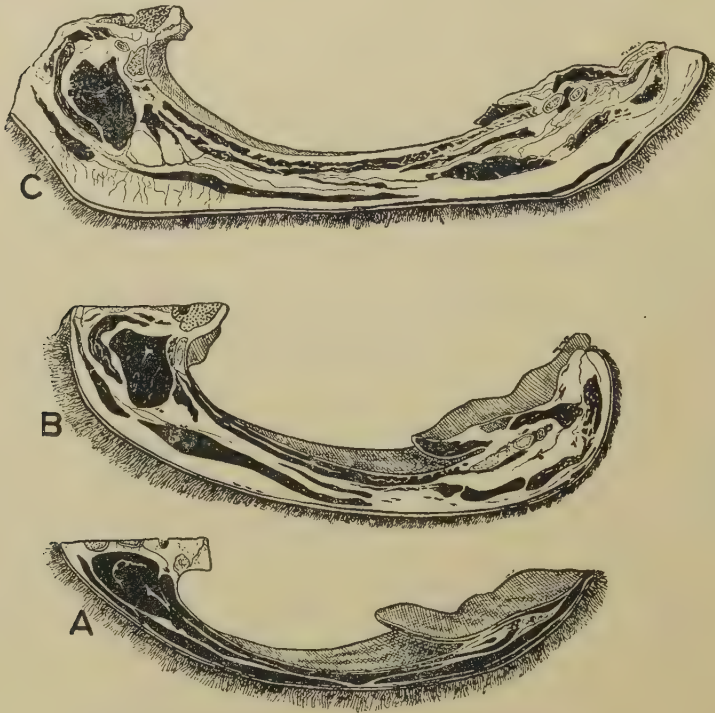


FIG. 11.—Proportions of lean and fat in beef cattle. Half cross-sections of body between sixth and seventh ribs, showing thickening of flesh due to deposition of fat. A represents an animal in very thin condition. The white shown in A is chiefly connective tissue. B represents an animal in all respects similar to A, except that it was full fed for four months and was in moderately fattened condition. C represents a similar animal full fed for twelve months and made excessively fat. A was 3 years old when slaughtered; B, 3½ years; C, 4 years. Deposition of fat within the muscles, known as "marbling," is noticeable in B and C. Note that increase in flesh in mature cattle due to feeding is almost entirely an increase in fat, the quantity of muscle remaining nearly constant.

is a characteristic roll or swell to the flank as the hind leg swings forward. This is not noticeable in a thin animal. The thickness of the tongue-root may be determined by grasping the part with the thumb and fingers.

Some individuals fatten smoothly, with no special tendency to bunch the fat in patches or rolls at certain points, while others be-

come "rolly," or "patchy," in spite of all the feeder's skill. Patches and rolls are most often found about the tail-head and end of the rump, along the ribs, and at the edge of the loin. The occurrence of these is highly undesirable; they indicate an improper distribution of fat, give the animal a rough appearance, and, when the animal is slaughtered, the carcass is discounted, for then the bunches of fat are very evident and the appearance is spoiled. The fatter the steer becomes, the greater is the tendency toward patchiness, yet many animals begin to exhibit this defect before they are really ripe and ready for market.

Style has actual market value in a fat steer. A stylish steer is one that stands squarely on his feet, with his back level, head well up, and eyes and ears attentive to what is going on about him. This does not mean a nervous animal, but a wide-awake one, full of life, and seemingly interested in the things about him. When he walks, he does it easily and without awkwardness. Other things being equal, such a steer will attract buyers much more quickly than an animal that slouches while standing, showing a pronounced dip in the back, and having an awkward stride when in motion. These two animals may dress out equally high, and yield equally valuable carcasses; the difference is that the first steer forces his good points to the attention of the buyer and shows for all he is worth, while in the case of the second steer, the buyer is left to discover the animal's good points without any assistance from the animal. Cattle with style sell more readily and at slightly higher prices than cattle without style.

Size and weight vary according to age, sex, breed, and fatness. Disregarding breed differences, for this factor need not be considered here, the following figures represent fair standards of weight at different ages for well-fattened steers:

Age	Weight
At birth	70 pounds
6 months	450 pounds
12 months	850 pounds
18 months	1,100 pounds
24 months	1,300 pounds
30 months	1,475 pounds
36 months	1,600 pounds

Age from the teeth.—The ages of cattle may be determined with a fair degree of accuracy by an examination of the teeth. There are eight incisors in the lower jaw of mature cattle. There are no incisors in the upper jaw, but a tough, fibrous pad instead,

amply suited to the grazing habits of cattle. The dentition at various ages is as follows:

Age	Incisors
12 months.	All calf teeth in place.
15 months.	Center permanent incisors appear.
18 months.	Center permanent incisors in wear.
24 months.	First intermediates up.
30 months.	Six broad incisors.
36 months.	Six broad incisors in wear.
39 months.	Corners up.
42 months.	Eight broad incisors in wear.

CHAPTER II

THE BEEF CARCASS

Buyers of fat cattle at the large market centers make their bids largely according to their estimates of the kind of carcasses the animals will yield. These estimates are made with considerable accuracy because the buyers have made a study of carcasses and of the cuts which they yield. A similar knowledge of meats is essential to the beef producer in order that he may learn to judge and value beef cattle correctly.

Slaughtering and dressing.—Upon reaching the packing house, cattle rapidly pass through the following operations of killing and



FIG. 12.—Knocking cattle.

dressing:¹ 1. Driven into knocking pens, two animals to each pen, and stunned or killed by heavy blow of sledge hammer on forehead. 2. Hoisted by hind legs, bled, and head skinned and removed. 3. Lowered to floor, shanks skinned and removed at knees and hocks, and hide opened along middle of belly and removed from belly and sides. 4. Partially raised by hocks, middles opened, viscera removed, hide removed from rump and rounds, and tail skinned and removed. 5. Carcass raised from floor, hide removed

¹ Wentworth, Munneke and Brown: *Progressive Beef Cattle Raising*, Armour and Company, Chicago, 1920, pp. 74, 75.

entirely, and carcass split through center of backbone from tail to neck. 6. Sides of beef suspended from overhead rail, washed with warm water, wiped dry, and sent to coolers.

Briefly, the above operations consist of stunning, bleeding, removal of hide, head, shanks, tail, and viscera, splitting, washing, drying, cooling. All internal organs are removed except the kidneys. The time required for slaughtering and dressing is about one hour. The temperature of the coolers is kept at about 34 degrees Fahrenheit and the sides of beef hang in the coolers for at least 48 hours before being quartered or otherwise cut up. Prime beef requires three to four weeks ageing in the cooler to arrive at its best condition.

The offal.—The blood, head, shanks, tail, hide, viscera, and loose fat are collectively called the “offal” or “waste” of the steer, so called because formerly, with the exception of the hide, tallow, and tongue, the offal was thrown away. Today all of it is valuable for manufacturing into various by-products. (See Chapter III.)

The dressing percentage.—By comparing the weight of the chilled carcass with the live weight of the animal, the percentage of yield, or what is called the “dressing percentage,” is determined. This is a very important factor in determining the market price of cattle for slaughter; the buyer always estimates the dressing percentage before bidding on a load. For example, if steer No. 1 weighing 1,200 pounds on foot yields a carcass weighing 720 pounds, the dressing percentage is 60. If steer No. 2 of the same live weight yields a carcass weighing 690 pounds, the dressing percentage is 57.5. Steer No. 1 dresses 2.5 per cent higher and yields 30 pounds more carcass beef than No. 2. If steer carcasses of this grade are selling at \$20 per cwt., then 30 pounds of carcass beef is worth \$6. This means that steer No. 1 is worth \$6 more on foot than No. 2, a difference equal to 50 cents per cwt. In handling thousands of animals, as do the large packing firms, the dressing percentage is a matter of great importance. The range in the dressing percentages of cattle is from 35 to 70 per cent. Census returns indicate that the average dressing percentage of cattle is about 54 per cent and of calves about 62 per cent. Calves dress a higher percentage than cattle because the hide is left on the veal carcass to preserve the color and moisture of the flesh, which dries out and turns dark much more rapidly than beef when exposed to the air.

Dressing percentage as a factor in cattle prices.—If steer No. 2 described above sells on foot at \$11.50 per cwt., steer No. 1 should bring \$12 per cwt. In this instance an increase in dressing percent-

age of 2.5 per cent added 50 cents per cwt. to the live value. Note that the difference between these steers in dressing percentage (2.5) multiplied by the price of one pound of carcass beef (20 cents) gives the difference in live value per cwt. (50 cents.) When, as in this instance, two animals yield carcasses of the same value per pound, *then the difference in live value per cwt. will be the difference in dressing percentage multiplied by the price of one pound of carcass beef.* From this we see that the price the packer can pay for cattle is limited very largely by two important factors—(1) the dressing percentage and (2) the price he can obtain for carcass beef. A third important factor affecting the market price of cattle, the value of the by-products, is discussed in the next chapter.¹

Factors determining dressing percentage.—The chief factors determining the dressing percentage of a steer are (1) quantity of flesh, both lean and fat, (2) paunchiness, and (3) refinement of head, bone, and hide. Well-bred steers, well fattened and with straight lines, that is, free from paunchiness, dress out 62 to 65 per cent. The highest record known to the writer, where the steer was dressed in the usual manner, is 69.9 per cent. Aged dairy cows which have outlived their usefulness as milk producers are sent to market; they are very paunchy and very thin, and dress around 45 per cent. Here a fourth factor in dressing percentage is introduced, namely weight of udder, which sometimes is considerable. The cow's udder is removed in slaughtering. In determining the dressing percentage, the refinement of head, bone, and hide is of less importance as a rule than quantity of flesh or paunchiness, although in some animals the weight of hide is a considerable item.

How the carcass is produced.—Before discussing the qualifications of a good carcass, it will be profitable to consider briefly how an animal grows and builds up the parts of its body which eventually make up the carcass. The carcass consists of bone, muscle, connective tissue, and fat. At birth the calf weighs about 70 pounds. Its bone are soft and elastic, and its muscles are tender. It carries a certain degree of fatness, depending on how well it was nourished

¹ Usually the returns from the sale of both carcasses and by-products enable packers to pay more for live animals than they receive from the sale of the carcasses. (See table, page 69.) If packers pay exactly as much for the live animal as they receive from the sale of the carcass, *then the live value of the animal per cwt. is the dressing percentage multiplied by the price of one pound of carcass beef of the class and grade yielded by the animal.* For example, if the dressing percentage is 60 and the carcass is of a class and grade selling at \$20 per cwt. (20 cents per pound), the live value of the animal is \$12 per cwt. Thus we see that the packer buyer must use good judgment not only in estimating dressing percentages, but also in estimating the grade of carcasses the animals will yield.

before it was born—in other words, on how well its mother was fed. Up to weaning time it subsists largely upon its mother's milk, which is primarily a bone and muscle builder, producing growth.

When weaned, the future development of the calf depends upon (1) ancestry, (2) feed, and (3) management. If its ancestors were dairy animals, it will not produce a valuable carcass. However, we are dealing with beef production and will assume the calf is from a good line of beef cattle. If given plenty of feed and good care, in other words every opportunity to develop quickly, the calf rapidly increases in size and its flesh expands and thickens. It also lays on fat. It is not an easy matter to fatten young animals because they tend to utilize their feed for growth rather than fat. Growth is increase in bone and muscle. However, with heavy feeding, beef cattle of the modern, blocky type, become fat before reaching maturity, and may be sent to market under 18 months of age weighing 700 to 1,000 pounds. Such animals are called "baby beeves."

Another way to handle the calf is to turn it out to pasture and perhaps help it along with a little grain if the pasture is short. In this case the object is to produce growth only, and the animal may then be finished as a two-year-old. Under this plan the animal should be roughed through the winter with care, otherwise it will receive a setback. Once the baby fleshing is lost through setbacks received during development, the steer does not make as desirable a carcass as he would otherwise.

Changes in the bones.—As an animal increases in age, its bones become hard and flinty. The bones which bear the most strain become most flinty, these being the shank bones. In young cattle the tips of the spinous processes of the vertebræ are soft and cartilaginous. These "buttons," as they are called, are present up to the age of 18 months; thereafter they gradually ossify, and at about the fifth year the spines are hard to the tips. Similar changes take place in the cartilages on the breastbone before the third or fourth year. The breastbone, backbone, ribs, and pelvis gradually harden and whiten, especially after the age of 18 months.¹ When visiting a beef cooler, the age of the animals from which the carcasses came may be told approximately by the bones.

Changes in the muscles.—With increase in age the muscles become tougher through use. The muscles which the animal uses most and which do the most work become the toughest in their make-up; these are the muscles of the neck and those used in locomotion, including the muscles of the thigh, shoulder, and arm.

¹ Ill. Bul. 147, p. 158.

Storage of fat.—Wild animals store up fat in their bodies as a reserve upon which they rely in times when food is scanty. The bear, for instance, stores much fat during summer and fall, which is resorbed and used to support life during hibernation in winter, and he comes out in the spring in very thin condition. The storing



FIG. 13.—Prime steer carcass. Champion beef carcass at the 1917 International Show, from Pandean Jr., an Aberdeen-Angus yearling steer, bred, fed, and exhibited by Iowa State College. Live weight 1,185 pounds, dressed weight 789 pounds, dressing percentage 66.58. Carcass sold for 41½ cents per pound. This carcass was practically ideal in every respect. Show carcasses of beef are dressed with the tail on.

of fat is a provision of nature. In the domestic animals which produce meat, man has encouraged this fat-storing tendency by methods of breeding and feeding. That great success has been

achieved along this line is shown by the highly finished cattle, sheep, and hogs coming from the hands of the best stockmen. Fat is stored over the back, loin, rump, ribs, and shoulders, forming a layer of clear fat just beneath the skin. It is also stored about the internal organs, between the muscles, and within the muscles among the muscle fibers. This storing of fat among the muscle fibers gives the cuts of beef a marbled appearance, termed "marbling." Practically no fat is deposited in the muscles which do much work, hence we find the round steak coming from the thigh to be almost completely free from fat. The muscles of the loin and back, having little work to do, take on the marbling feature quite easily if the animal is well bred and properly handled. This largely explains why the cuts from the loin and back are most tender, although in these muscles there is not the stimulus to the growth of connective tissue such as is the case in working muscles, and this is undoubtedly another reason why the loin and back yield cuts of superior tenderness.

As stated in the preceding chapter, the feeding of mature cattle is essentially a fattening process. This is clearly shown by results at the Missouri Station,¹ where muscle fibers and fat cells extracted from steers at different periods during the fattening process were examined and measured under the microscope and it was found that while there was very little or no increase in the diameter of the muscle fibers, the fat cells increased enormously both in number and size.

Thus we understand why cattle differ widely in the kind of carcasses they yield, depending upon their inherited tendencies and upon their feed and care. The effects of inheritance are discussed in more detail in Chapter IV.

Variations in carcasses.—A study of the carcasses in any cooler brings out striking differences. Some are large, being from 1,500- to 1,600-pound animals; others are from younger beeves that weighed 800 to 1,100 pounds. Some are compact and wide, others are long and narrow. Some are well developed in the regions of high-priced cuts, while others are deficient in this respect. Some carry heavy fleshing, others are very poorly covered indeed. The layer of outside fat is very thick in some, these being highly finished cattle fed on grain. Others show practically no covering of fat. These are from grass-fed cattle—poor pasture too, for a steer puts on some fat on grass if the pasture is good. Some show a nice inter-

¹ H. J. Waters: Influence of Nutrition Upon the Animal Form, paper presented at Thirtieth Meeting of Society for Promotion of Agricultural Science.

mixing of fat and lean, called "marbling," while others exhibit this feature very slightly, or none at all. The lean meat of some carcasses has a pale red color; in others it is very dark. Some carry snow-white fat, others carry fat of a yellow color. Some beef is fine grained, and some is very coarse and fibrous. Some carcasses have soft bones, somewhat cartilaginous in character; others have hard flinty bones. Size of bones varies a great deal in different carcasses.

Demands of the butcher and consumer.—The questions which now come before us are: 1. What kinds of lean meat and fat does the butcher want? 2. How much lean meat does he want, and how much fat. 3. How does he want these two substances arranged with regard to each other?

These questions bring up the demands of consumers of meats, for the butcher is guided by what the consumer of beef wants and will pay for. You and I are consumers of meat, and what we like, or dislike, together with the size of our pocketbook, guides the butcher who buys our cattle. Now what do we want? We want meat that is (1) nutritious, (2) tender, (3) juicy, (4) of good flavor, (5) attractive in appearance, and (6) moderate in amount of outside fat. Provided beef is well ripened in the cooler and well cooked, there is not much variation in its nutritive or food value. The tenderness depends upon the work the muscle has done and upon the amount of marbling it carries. Meat free from fat shrivels and dries up when roasted, becoming dry and tough. Ageing or ripening in the cooler helps to make meat tender. Juiciness results from the presence of fat and manner of cooking. The flavor depends mostly upon fatness and upon proper ripening of the carcass. The cuts of beef which are most attractive in appearance are those with bright, rich, red lean, snow-white fat, and a high degree of marbling. The consumer desires a maximum of lean meat well marbled, and a minimum of bone and outside fat in the cuts of beef. Following is a discussion of the qualifications of a high-class carcass:

1. Weight of carcass.—The heaviest carcasses seldom exceed 1,050 pounds, and the minimum is about 250 pounds.¹ No definite line as to weight can be drawn between carcasses of beef and veal, because many factors determine the character of the flesh. The greatest demand is for carcasses from 800- to 1,200-pound steers, and most of the cattle coming to market are of about these weights.

¹ For many of the specifications included in this chapter the writer is indebted to Illinois Bulletin 147, Market Classes and Grades of Meat, by Louis D. Hall.

Such carcasses yield retail cuts of a size to suit the average family. There is also a demand for heavy carcasses to supply hotels, restaurants, and dining cars, which use large cuts.

2. Shape of carcass.—The ideal carcass of beef is compact, plump, and has good width in proportion to length, short shanks and neck, and full rounds, loins, and ribs. Such a carcass is more thickly fleshed and is usually better finished in all cuts than one that is long, narrow, and loosely coupled.

3. Thickness of fleshing.—There is a clear distinction between thickness due to fatness and thickness due to muscular flesh. Only the knife can completely reveal the thickness of a side and the relative thickness of fat and lean; even expert dealers are often mistaken as to the actual thickness of flesh in an uncut side.



FIG. 14.—Beef ribs. The rib cut on the left is too fat, the one on the right is too lean, and the cut in the center is correctly fattened. Note that the amount of lean meat is practically the same in all three.

4. Thickness of outside fat.—This is referred to as the “finish.” Perfect finish consists of a smooth covering of firm white fat over the entire carcass, with the greatest depth along the back, a white brittle “kidney” of medium size, and a lining of flaky fat on the inner surface of the ribs. The rounds and shanks are covered last in the process of fattening. Carcasses show variation in thickness of external fat, ranging all the way from zero to four inches. Beef fat is not palatable to most people. The average consumer does not want more than one-half or three-fourths of an inch of outside fat, and if the carcass weighs 500 pounds or less, about one-fourth of an inch is sufficient. It is impossible to secure proper marbling unless a certain amount of fat is put on externally at the same time, but the necessary marbling is usually secured when one-half or three-fourths of an inch of fat is laid on externally; after

this point is reached, the fat is largely stored externally, between the muscles, and about the internal organs. A certain amount of outside fat is necessary in prime beef in order to insure proper ripening in the cooler, and also for proper roasting. In the lowest grades, such as canners, outside fat is entirely lacking and such carcasses will decompose before they ripen. A carcass carrying soft, "gobby" fat sells at a discount. Grass-fed cattle often yield carcasses that are watery and flabby, with a marked lack of finish. Heifers carry a higher percentage of fat in all cuts than do steers. This is one of the principal reasons why they often sell at a discount in this country while in England they are not discriminated against because the Englishman likes fatter beef.

Cattle fed to a complete finish, as are the beef cattle exhibited at the larger live-stock shows, carry a great excess of outside fat—far too much to suit the average consumer. This excess of tallow adds practically nothing to the value of the carcass as food. In a way, the fat-stock shows set a wrong example for feeders to follow. Such a finish results from a long feeding period of 8 to 10 months, and in some cases even longer. A 3 to 6 months feeding period gives a carcass which suits the consumer better, and such a plan is undoubtedly more profitable to the feeder, because the first gains a steer makes are acquired much more cheaply than the last ones. This does not mean that the farmer should send thin cattle to market; it means there is a place to stop in the feeding of a bullock which results in greatest profit to the producer and best satisfaction to the consumer. A smooth and firmly finished steer is the sort this implies. As bearing on the matter of cost of gains, the Kansas Station¹ found the grain required for 100 pounds of gain with fattening steers for different periods to be as follows:

	Grain for 100 lbs. gain	Increase of feed required
Up to 56 days.....	730 pounds of grain	
Up to 84 days.....	807 pounds of grain	10 per cent
Up to 112 days.....	840 pounds of grain	15 per cent
Up to 140 days.....	901 pounds of grain	23 per cent
Up to 168 days.....	927 pounds of grain	27 per cent
Up to 182 days.....	1,000 pounds of grain	37 per cent

These figures indicate the heavy cost of thoroughly fattening a steer, and the importance of selling as early as it is possible to attain the proper degree of finish.

5. Marbling.—The highest quality of beef is that which contains the largest proportion of well-marbled lean.

6. Color of lean meat.—The meat from grass-finished cattle is

¹ Kan. Bul. 34.

often dark in color. Grain feeding gives the best color—a bright, rich red. Dark color is due to the presence of much blood in the tissues. Exercise or excitement will bring about this condition. Stags and bulls kill out dark because of their restlessness, and of heifers in heat the same is true. Dark carcasses break down (decompose) quicker than light-colored ones, and consumers object to the appearance, hence butchers have two good reasons for disliking a dark-colored carcass.

7. Color of fat.—A clear white color of fat is desired. An unattractive yellow color is rather frequently met with. Some packers believe the yellow color is due to the kind of feed upon which the



FIG. 15.—Well-marbled beef. Rib roast showing correct proportion of fat to lean, and a high degree of marbling.

animal was fattened. Cottonseed meal has been charged with this fault, but experimental work has shown that cottonseed meal does not produce yellow fat. Cattle of Jersey and Guernsey breeding usually kill very yellow.

8. Grain of meat.—When the fresh-cut surface is viewed, it should show a smooth, fine-grained appearance, and should feel “velvety” to the touch. Meat with fine grain comes from the animal with quality, that is, one with fine hide, hair, and bone. Such an animal is finely textured throughout, and if well fed, so that the baby fleshing is preserved, a carcass with fine-grained flesh will result. Some meats are very coarse indeed.

9. Size of bones.—The bones should be as small as the weight

of the carcass will allow. From the producer's standpoint, however, such carcasses do not always represent greatest profits, because extremely fine-boned cattle do not usually make the greatest gains on feed.

10. Flintiness of bones.—As already shown, flintiness of the bones is an indication of age. The most desirable carcasses are those of young animals approaching maturity, the meat from old ones being tough, dark-colored, and lacking in marbling. The bones of cows and heifers, and of dairy-bred animals, turn hard and white earlier than those of steers, indicating quicker maturity.

Grading carcasses.—As to the relative importance of the above factors in grading carcass beef, it may be said that finish (by which is meant the thickness and smoothness of outside fat) is particularly essential, with thickness of flesh, fineness of grain, color of lean and fat, fineness of bone, and shape of carcass of about equal importance.

All carcasses not suitable for block beef.—Carcass beef which is thick and fat enough so that the entire side can be sold over the butcher's block in retail cuts is known as "block beef" or "side beef." Carcasses that are not thick enough in flesh to be entirely utilized by the retailer are called "cutters." The loins and ribs of cutters may be sold over the block. "Canners" are the worst carcasses to be found, from which none of the regular wholesale cuts may be sold over the block, but which must be disposed of as boneless fresh meats and cured beef products.¹ Fully 95 per cent of the beef produced in the United States is sold in the fresh state.

Carcass classes and grades.—All carcasses of cattle are classified and graded as follows:

Class	Grades
Steers	Prime, choice, good, medium, common, cutter, canner
Heifers	Prime, choice, good, medium, common, cutter, canner
Cows	Choice, good, medium, common, cutter, canner
Bulls and stags	Choice, good, medium, common, bologna, canner
Veal calves	Choice, good, medium, common, canner

The following wholesale prices² indicate the comparative values of those grades of the above classes which are suitable for block beef:

Class	Weight	Price
Steer carcasses....	300 to 700 lbs.....	16½ to 24 cents per lb.
Heifer carcasses...	200 to 600 lbs.....	16¼ to 23½ cents per lb.
Cow carcasses.....	300 to 700 lbs.....	14¼ to 17¾ cents per lb.
Bull carcasses.....	600 to 800 lbs. and up.....	14 cents per lb.
Veal carcasses.....	45 to 220 lbs., hides off.....	14½ to 25 cents per lb.

¹ Ill. Bul. 147, p. 156.

² Wholesale price list of a leading Chicago packer, May, 1930.

Sex differences.¹—Steer carcasses are identified by the cod fat and generally by their full, fleshy rounds and loins, heavier, coarser bones, and short necks as compared with cows. They show more quality and finish than any other class, and are sold as carcass beef more extensively than any other class except heifers. Heifer carcasses are distinguished by the udder, and usually they have smaller bones, more prominent hips, more angular rumps, less development of lean meat, and they average lighter in weight. The tendency in heifer beef is to carry the fat more extensively as kidney suet or gobby fat than do steers. They have flatter loins,

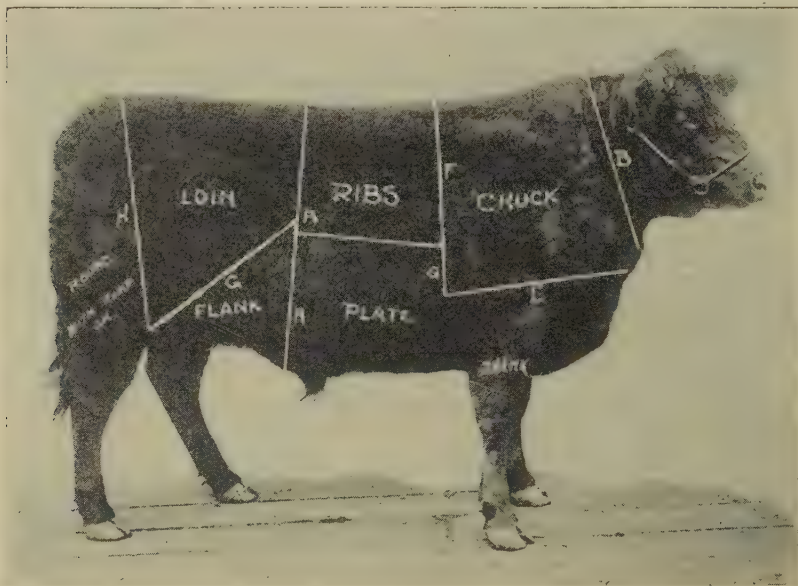


FIG. 16.—Cuts of beef indicated in the live animal.

flatter plates, and longer, thinner necks than steers. Carcasses of cows have the bag trimmed off as closely as possible. The form is angular, the neck long, the bones hard and white, and the majority lack thickness of flesh. Fat cow carcasses often carry an excess of kidney fat and bunches of fat on the back and rump. The flesh is seldom as well marbled as that of heifers or steers. Cow carcasses require more ageing or ripening to make the meat tender. Dressed bulls are easily recognized by the heavy neck and heavy shoulders, thick rounds, dark color, coarse-grained flesh, and absence of cod fat. They have rough shape and the bones show maturity. The coarse dark flesh has no marbling as a rule, and but few bulls are

¹ Ill. Bul. 147.

suitable for dressed beef. They are used for sausage and the rounds are made into smoked beef hams. Many stags approach steers in form, quality, and finish; others resemble bulls.

The wholesale cuts.—When the carcass has been sufficiently ripened in the cooler, it is ready for cutting up into the wholesale cuts. The full side of beef, half the carcass, has the appearance shown in the following diagram. The wholesale cuts are indicated by the dotted lines.

The first step in cutting up a side of beef is to “quarter” or “rib” it, which means to separate the side into forequarter and hindquarter. Sides are usually quartered or ribbed between the 12th and 13th ribs, leaving one rib on the hindquarter. Such a hindquarter is called a “regular hindquarter,” and it contains from

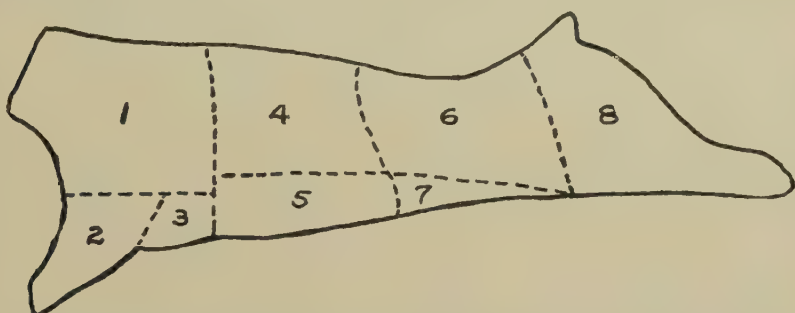


FIG. 17.—Wholesale cuts of beef. 1, Chuck; 2, shank; 3, brisket; 4, rib; 5, navel; 6, loin; 7, flank; 8, round; 3 and 5, plate; 6, 7, and 8, hindquarter.

47 to 49 per cent of the weight of the side, and the forequarter contains from 51 to 53 per cent, the averages being about 48 per cent hinds and 52 per cent fores. Hinds are quoted about 25 per cent higher than fores in cold months, and up to 40 per cent higher in summer. This variation is due to the large amount of boiling and stewing pieces in the fores, which meats are in greater demand in winter.¹

The hindquarter is divided into four wholesale cuts, the loin, round, flank, and kidney. The kidney is not shown in the accompanying diagram; it lies under the loin.

The forequarter yields five wholesale cuts, the rib, chuck, navel, brisket, and shank. The navel and brisket are usually not divided, but are sold as one cut called the “plate.”

The loin is separated from the round at the hip joint, which is a considerable distance back of the hip. Thus much of the rump is converted into loin when the carcass comes under the knife of the

¹ Ill. Bul. 147, pp. 155, 156.

butcher. The shank is sawed off just below the shoulder joint. The plate is taken off on a line extending from about the middle of the twelfth rib through the point at which the shank is removed. The rib and chuck are separated between the fifth and sixth ribs. This gives five ribs to the chuck and seven to the rib.

A 720-pound carcass will yield a 360-pound side. When the side is cut up, the weights of the various wholesale cuts, their wholesale prices per pound, and their total values are as given in the following table, the figures for weights representing averages for good steer carcasses. Prices are given for No. 1, No. 2, and No. 3 grades.

Weights, prices, and values of wholesale cuts of beef

Wholesale cuts	Wts. in lbs.	Wts. in per cent	Price per lbs., cents			Total value of cut		
			No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
Round	80	22	26	25	24	\$20.80	\$20.00	\$19.20
Loin	65	18	46	43	37	29.90	27.95	24.05
Flank	18	5	14	14	12	2.52	2.52	2.16
Rib	35	10	34	31	27	11.90	10.85	9.45
Plate	50	14	18	17	15	9.00	8.50	7.50
Chuck	90	25	19	18	16	17.10	16.20	14.40
Shank	11	3	14	14	12	1.54	1.54	1.32
Kidney	11	3	14	14	14	1.54	1.54	1.54
Total	360	100	26.2	24.7	22.1	94.30	89.10	79.62

High-priced and low-priced cuts.—The average price for the entire No. 1 carcass is, then, 26.2 cents per pound. From the foregoing table it is seen that the loin and rib constitute 28 per cent of the carcass weight, but bring 44 per cent of the total return from the sale of the cuts from the No. 1 carcass; and that the loin, rib, and round constitute half of the carcass weight, but bring 66 per cent of the return from the sale of the wholesale cuts. The 180 pounds of loin, rib, and round have an average price of 34.8 cents per pound, while the remainder of the side, also weighing 180 pounds, brings an average of 17.6 cents. Hence the packer wants cattle as highly developed in back, loin, rump, and round as possible. Buyers of cattle for slaughter emphasize this point. They want cattle smoothly and heavily fleshed in all parts, and especially in the four parts mentioned. The selling price of a load of cattle is greatly dependent on this feature.

Note that there is less variation in price between No. 1 and No. 3 rounds than between the corresponding grades of loins or ribs. This is due to the fact that all grades of rounds contain but little fat, whereas loins and ribs of the various grades show a vast difference in finish. In other words there is much less difference in the

quality and finish of the rounds yielded by fat and thin cattle than there is in the quality and finish of the loins or ribs.

Why loin, rib, and round are in greater demand.—The loin and rib bring high prices as compared to other parts of the carcass because of their superior tenderness, marbling, and palatability, combined with attractive appearance. The round brings a good price because it contains so much lean and so little bone and outside fat. Other parts of the carcass are as nutritious as the loin, rib, and round, but are difficult to cook in such a way that they appeal to us as do the porterhouse, sirloin, and rib roast. But a carcass will yield only so much of these, hence the great variation in the price of the various wholesale cuts. It is perhaps well that there are cheap cuts of meat and cheap carcasses, for there is a great percentage of population not able to buy any other kind. The packer does not want all beef to be of highest quality. He must take care of the second- and third-class trade as well as the fancy trade. But the producer of market cattle must aim to produce the highest quality of product, for this work requires skill, and skill always commands a higher reward than unskilled effort. Anybody can produce medium or inferior beef, and the price obtained is in proportion.

Grades of beef cuts.—As previously shown, carcasses vary in respect to (1) size, (2) shape, (3) thickness of fleshing, (4) thickness of external fat, (5) marbling, (6) color of lean meat, (7) color of fat, (8) grain of meat, (9) flintiness of bones, and (10) size of bones. The butcher or packer is interested in all these things, for each is of considerable importance. The packer grades the wholesale cuts of beef, as they vary in these points, into No. 1, No. 2, and No. 3 grades. No. 1 cuts bring the highest price. These three grades are all used on the butcher's block. Cuts from inferior carcasses not suitable for block use, are called "strippers;" these are manufactured into boneless cuts, barreled beef, and sausage.

Conclusions.—The study of the beef carcass therefore teaches:

1. That well-bred cattle yield the best carcasses and bring the highest price.
2. The market wants young, highly finished cattle.
3. Steers yield the most desirable carcasses.
4. The best results come from a method of management which offers no chance for a setback during growth and fattening.
5. The breeder and feeder of beef cattle should secure as high development of loin, back, and hindquarter as possible.
6. To bring a good price, cattle must dress high.

7. To dress high, cattle must be thickly fleshed, free from paunchiness, and good in quality.

8. Broadly speaking, heredity regulates the lean meat, and man regulates the fat.

9. The feeding of mature cattle is almost entirely a fattening process.

10. Fatness is desirable because it adds weight, makes perfect ripening possible, gives tenderness and juiciness to the meat, and increases the dressing percentage.

11. Cattle may be made too fat.

12. Carcasses vary widely in weight, shape, thickness of fleshing, thickness of outside fat, marbling, color of lean, color of fat, grain of meat, and size and hardness of bones.

13. Ancestry, age, sex, feed, and care determine what sort of a carcass an animal will yield.

14. Half of the carcass meets with strong demand and sells high, while the remainder sells low.

15. There is demand for carcasses of all weights, but the strongest demand is for handy-weight carcasses from cattle weighing 800 to 1,200 pounds.

16. To secure the greatest returns, the feeder should send his cattle to market carrying a high degree of finish, but not in an excessively fat condition resulting from long continued feeding.

CHAPTER III

PACKING HOUSE BY-PRODUCTS FROM CATTLE

When slaughtered, the average steer yields over 40 per cent of offal. In the early days of the packing industry the only by-products of a beef animal which received attention from packers were hide, tallow, and tongue. The remainder of the offal was either thrown away or sold for almost nothing. In some instances, packers even paid for the carting away of offal. In a short time glue works, fertilizer works, soap factories, oil and tallow factories sprang up in the vicinity of the packing plants and grew to be large industries. Soon the packing plants went into the soap business

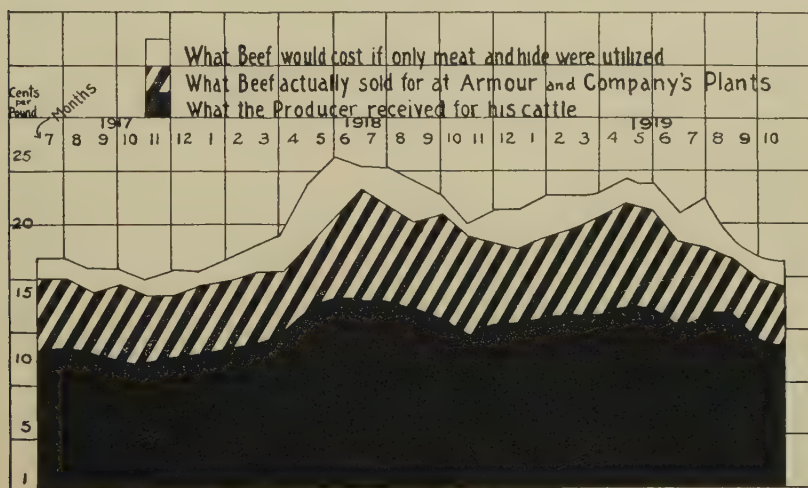


FIG. 18.—How by-products reduce dressed beef prices.

for themselves, then into the glue business, the fertilizer business, and so on, until today packing house by-products are numbered by the score from what was formerly mere waste. The modern packing house is living and depending for profits on what the packing industry of early times was throwing away. The utilization of by-products is one of the chief reasons why packers are able to compete so successfully with the local butchers of the country. Were it not for this conversion of waste material into saleable form, the wholesale price of beef would be considerably higher than under

existing conditions. This is clearly illustrated by the accompanying graph.

Average yields from steers.—A Chicago packer has computed from numerous tests the following weights and percentages of yields from a steer:

	Pounds	Per cent of live weight
Live weight	1,200	
Carcass	700	58.3
Hide	75	6.2
Head, feet, knees	45	3.7
Butter-fat	80	6.6
Liver	12	1.0
Heart	3	0.25
Lungs	20	1.6
Tongue	5	0.41
Cheek meat	5	0.41
Rough tallow and entrails	84	7.0
Liquid blood	46	3.8
Paunch and contents	106	8.8
Lips and weasand meat	4	0.3
Tail, lungs, and casings	15	1.2
Total offal	500	41.27
Totals	1,200	99.57

The foregoing weights and percentages are for "green" or "warm" products at time of slaughter, no allowance being made for shrinkage in weight of carcass in cooling, shrinkage of the hide in curing, and evaporation of moisture and shrinkage in converting other parts into finished by-products. The Commercial Research Department of Swift and Company, Chicago, Ill., reports ¹ that on the average about 55 per cent of a steer is beef, and that the average 1,000-pound steer yields about 550 pounds of beef and about 150 pounds of finished by-products. The remaining 300 pounds is accounted for in evaporation, shrinkage, and waste in manufacturing the green by-products into finished by-products.

Comparative value of carcass and by-products.—Edward N. Wentworth of Armour's Livestock Bureau states ² that for the half year ending June 30, 1930, the average value of the meat yielded by the cattle slaughtered at nine of Armour and Company's plants was \$97.08 per head, hide \$6.59, and all other by-products \$6.62. Expressed in percentages, the carcass represented 88 per cent of the total value, the hide 6 per cent, and all other by-products 6 per

¹ Studies in Live Stock Marketing, The Effects of Beef and By-Product Values Upon Cattle Prices, Swift and Company, Chicago, Sept., 1921.

² Information to the author.

cent. Over 33 per cent of the value of "all other by-products," or \$2.20, was in the oleo fats.¹

That these ratios are not constant is shown by the table presented on page 69. The table shows that the percentage of total returns derived from by-products by Swift and Company was 23 per cent in 1915, but only 10 per cent in 1921.

Values of cattle hides.—As shown in the preceding discussion, the most valuable of all the by-products of the beef animal is the hide. Cattle hides increased in value enormously from 1913 to 1919 inclusive, due in large part to the unprecedented demand for leather during the World War. This is shown in the following table of prices from the Chicago Daily Hide Report:

Average yearly prices of heavy steer and heavy cow hides

Year	Packer hides		Country hides	
	Heavy native steers	Heavy native cows	Heavy steers	Heavy cows
1905	\$14.36	\$13.18	\$12.42	\$11.90
1910	15.66	13.78	12.15	11.20
1915	24.03	23.54	19.52	18.96
1919	39.76	37.72	31.98	29.97
1920	31.73	31.51	23.89	21.11
1925	15.96	14.82	12.94	11.64
1929	16.98	15.86	12.09	11.55

There are two great classes of cattle hides, packer hides and country hides. Packer hides are much more valuable and command higher prices because they are uniform in shape, cure, and handling, much freer from cuts and gashes, and are readily available in large numbers of the various classes and grades.

The fats.—Next in value to the hide stand the fats derived from the abdominal region. Cattle fats bear the general name of "tallow." Out of the finer and better of these fats, called "butter fats," is made oleomargarine or butterine. This food product appeared in 1866 and has since come into extensive use. The butter fats average in weight from 60 to 75 pounds to the animal, but a large percentage of this weight is lost in processing. One Chicago plant has a capacity of 15 tons of oleomargarine in a day, and in

¹ Wentworth reports that the veal calves slaughtered at nine Armour plants during the first half of the year 1930 returned \$21.87 per carcass and \$1.54 for the by-products per calf. The carcass represented 93.4 per cent of the total value, and the by-products 6.6 per cent. The low percentage value of the by-products of veal calves is largely due to the fact that the skin is sold on the carcass.

a year has put out between 8 and 9 million pounds. Inedible tallow fat is manufactured into soaps, glycerine, leather dressing, lubricants, illuminating oil, candles, and other products.

Other by-products.—Lean meat trimmings are made into sausage. Hair is used in plastering, manufacture of brushes and felt, and for other purposes. The horns and hoofs, at one time considered a rubbish nuisance, are now very valuable for the manufacture of combs, knife, cane, and umbrella handles, and many other articles. Dried blood is made into blood meal. Fibrous matter and scraps, after all the grease has been extracted, are ground to meat meal tankage, widely used as a hog feed. From all bone and cartilage the basic substance is extracted from which glue is made. Fully 18 per cent of dry bones is glue, the rest is ground to fertilizer. One Chicago packing plant turns out 8 million pounds of glue annually. From the intestines come drum snares, sausage casings, brewer's hose, and snuff packages, while the bladder yields packages for putty, snuff, and lard. From the glands come various pharmaceutical preparations, such as extract of thyroid, pituitary liquid, pineal substance, pancreatin, adrenalin, pepsin, rennet, etc. The tail furnishes hair for mattresses and upholstering, and the bone and meat are used for making ox-tail soup. Shank and thigh bones are cut into buttons, knife and tooth-brush handles, and other articles. The tongue, head and cheek meat, tripe, brains, heart, liver, and sweet-breads are sold for food. Tripe is pickled stomachs. Sweet-breads are the thymus and pancreatic glands. The contents of the stomach are burned under packing house boilers and the ashes are used for fertilizer. Every part of the live animal is utilized. Many of the finished by-products are manufactured by the packers, and other by-products are sold partly processed to other firms for final processing into finished products.

The price of live cattle depends upon the price the packer can get for beef and by-products after taking into account his expenses of operation. In the following table it will be noted that the packer paid more for the live animal than he received from the sale of the beef during the years 1915 to 1920 inclusive. But in 1921 and 1922 marked decrease in value of by-products, accompanied by increase in freight rates, made it impossible for the packer to pay as much for the live animal as he received for the beef.

Averages of Swift and Company's cattle, beef, and by-products operations for fiscal years 1915-1922, ending November 5¹

Fiscal years	Cost of live animal	Beef proceeds	By-product returns	Total expenses including freight	Profit and loss
1915.....	\$72.49	\$63.28	\$18.58	\$7.73	\$1.64
1916.....	73.68	63.98	19.08	7.73	1.65
1917.....	84.45	68.97	24.09	7.32	1.29
1918.....	92.70	81.45	22.06	9.79	1.02
1919.....	102.82	88.21	25.59	11.68	.70 loss
1920.....	93.85	86.81	21.17	13.69	.06 loss
1921.....	67.53	75.32	8.51	15.17	1.13
1922.....	64.72	67.25	13.45	13.46	2.52

Note that high freight rates affect the beef producer in two ways. They not only increase the cost of marketing cattle, but they also lessen the price the packer can pay for cattle after they reach the market. The packer ships carlots of dressed beef and other products from his plants to his branch houses located in all parts of the country. High freight rates on dressed beef shipments operate to increase the cost of beef to the consumer and to decrease the price paid the producer for the live animals. Higher costs to the consumer tend to lessen beef consumption. Thus, when freight rates are high, the producer is confronted by higher marketing expenses, a lower price, and a lessened demand. Freight rates are controlled by the Interstate Commerce Commission. The packer is protected against high rates to a considerable degree because his freight bill is passed along to producers and consumers. The consumer has no recourse except to eat less beef, and the producer has no recourse except to discontinue beef production if it proves unprofitable.

Do packers control prices?—In the foregoing paragraph the writer does not intend to intimate that the packer can at will mark down the price of cattle and mark up the price of beef. There is competition among packers and there is competition between packers and local butchers who do their own slaughtering. Even assuming, as has been charged, that some of the large packing companies are combined to control prices, there is a narrow limit beyond which they cannot go without injury to themselves. If they fix the price of dressed beef too high they greatly lessen beef consumption. If they fix the price of live cattle too low they greatly lessen production. In either case they lessen the volume of their business, and volume of business is the most important factor in the welfare of the large packing companies. Packers are equipped with immense

¹ Swift and Company Year Book, 1923, p. 16.

plants and employ large numbers of people. In order to make a profit they must keep the wheels turning; they must have a constant and adequate supply of live animals and a constant outlet for beef. Fully 95 per cent of the beef produced in the United States is sold in the fresh state. Fresh beef is a perishable product which must be kept moving out in a continuous stream from the packing plant. If the packer paid the producer enough to insure a supply of animals and then attempted to charge so high a price for meats as to insure a huge profit despite restricted volume of business, then many local butchers would stop buying packers' meats and would do their own slaughtering, and farmers' cooperative packing plants and other smaller packers would at once take advantage of the opportunity to capture the trade by pricing their beef below the high prices demanded by the large companies.

Suppose that packers should enter into a combination with producers, agreeing to charge higher prices for beef and pay higher prices for cattle. If this were attempted the market soon would be flooded with cattle far beyond the capacity of the packing plants or the consuming public, and it would be impossible to maintain the higher price for either beef or live cattle.

Through very high efficiency in packing methods and business administration, and small profits on sales, certain packing companies were enabled to underbid their competitors and build up large plants and a large volume of business. Efficiency and narrow margins are today just as essential in retaining this large volume of business as they were in developing it.

By ingenuity and enterprise the huge packing business of this country has been developed through continual improvement in methods of slaughtering, handling, and distributing meats and in methods of utilizing animal by-products, until the market for our surplus meat production has been made world-wide and a constant, open, cash market for live animals has been made possible.

From the live-stock producer's viewpoint it is best that we have in this country a large, highly efficient, reasonably profitable, and stable packing industry. If packing companies were continually going into the hands of receivers because of bad management or for other reasons, it would not be beneficial to either producers or consumers.

Large packers are continually in competition with small packers, and all packers are continually in competition with retailers who do their own slaughtering. If any combination of packing com-

panies fixes the prices of live animals, they have done a mighty poor job of it in those years in which cattle producers have made large profits.

Summary.—It would seem that the packer is now doing his share in supplying the people with good meat at a fair price. There can be no further expansion in the line of getting more product out of the animal, the limit in that direction having been reached. Further improvement in the quality and cheapening of the price of beef rests largely with the grower or producer of live stock. Much may be done on the production side of the business to bring about these results. More feed must be grown per acre, feeding must be done more economically, and better animals must be bred and fed for the market in order that greater returns may be secured for the feed consumed. The scrub animal must be eliminated through increase in numbers and extension of territory of the improved breeds of cattle. Thus more good purebred sires will be made available for grading up the common cattle of the country, and meats of better quality will be produced at lower cost.

CHAPTER IV

THE VALUE OF TYPE IN BEEF MAKING

In order to determine just what advantages are possessed by the beef-type steer as compared with the dairy-type steer, some experiments have been carried out which have resulted in interesting findings. It has long been known that beef steers suit feeders and butchers better than steers of dairy breeding. It has been claimed that beef steers gain faster in proportion to feed consumed, that they fatten more readily, dress out higher, yield a more valuable carcass, and hence bring a higher price on the market. Experimental results have upheld some of these views and disproved others.

In 1903, the Iowa Experiment Station¹ conducted a series of experiments dealing with the comparative merits of the two types for beef production. The object was to provide answers to the following questions. 1. Which type of steer makes the greater gains from pounds of feed consumed? 2. In the gains made what differences exist between the two types as to distribution of such gains over the body? 3. Which type of steer yields the greater profit to the feeder? 4. Which type shows the greater amount of offal? 5. Which type carries the higher percentage of tallow? 6. Which type carries the higher percentage of valuable cuts? 7. In considering the various commercial cuts from the two types, what differences are to be found as regards weight, thickness, covering of fat, marbling, color, and fineness of grain? 8. Is the low price paid for dairy-type steers due to prejudice, or to an actual inferiority in the value of the carcasses?

Four beef-type steers and four dairy-type steers were put on feed January 1, 1903, and fed one year. The steers were on dry feed during the entire time, so that the exact amount of feed consumed by each lot might be known. Of the four beef steers, two were high-grade Herefords, and two, purebred Angus. The four dairy steers consisted of two Jerseys and two Holsteins. The ages at the beginning of the test were approximately as follows: Average of Herefords, 16 months; of Angus, 18 months; of Holsteins, 24 months; and of Jerseys, 18 months. The feeds given were mixed hay, sorghum (during July and August), corn meal, bran, oil meal,

¹ Iowa Bul. 20.

and gluten feed. The conditions were alike for all the animals, and the feed was the same, but each animal was given all he would clean up regularly. At the end of the feeding test the cattle were bought in separate lots by the head buyer of a packing company of Des Moines, Iowa. The prices given were the market prices for such steers, December 28, 1903.

Following is a summary of the first part of the investigation:

	Beef steers	Dairy steers
Average weight at beginning, lbs.....	685	574
Average gain per steer, lbs.....	606	598
Average value of feed consumed per steer.....	\$47.27	\$45.18
Average cost of one pound of gain.....	7.81c	7.63c
Percentage of dressed weight in slaughter test.....	61.7	57.15
Selling value, average price per pound.....	4.888c	3.752c



FIG. 19.—Dairy-type steer. Jersey steer in the Iowa experiment at end of feeding period. Note the slack crops and fore-rib, paunchiness, and lack of muscling in this steer.

The dairy-type steers made their gains at a trifle less cost per pound than did the beef steers, indicating that their digestive and assimilative functions were slightly more vigorous in this instance. The gains made by the dairy steers were not distributed on the body in such a way as to command the highest prices. The beef-type steers made a large proportion of their gains on the back, loin, and hindquarters, while the dairy-type steers showed but little increase in thickness on these parts.

The beef-type steers were far more profitable to the feeder, for although both lots made approximately the same total gains, and al-

though the average of the four dairy-type steers compared with the average of the four beef-type steers shows that the former made his 600 pounds of gain cheaper by \$1.70 than did the latter, nevertheless this 600 pounds gain of the beef steer brought \$7.18 more on the market. When \$1.70 is deducted from \$7.18 there is left \$5.48 profit in favor of the beef animals, or a total of nearly \$22 for the four head. Nor does this represent all the financial advantage of the beef-type steer, for the value of the initial weight (685 lbs.) of the beef steer was increased to a greater degree by feeding than was the value of the initial weight of the dairy-type steer. The report of the experiment furnishes no initial valuations, hence a complete accounting in this regard cannot be made.

Following are the weights of the cuts from the carcasses, expressed in percentages of the total carcass weight, also the wholesale and retail prices of these cuts:

	Weights in percentages		Wholesale price per pound		Retail price per pound	
	Beef	Dairy	Beef	Dairy	Beef	Dairy
Ribs	9.27	8.80	12.25	10.25	17.6	16.
Chuck	25.97	26.78	5.5	5.1	10.	10.
Brisket	5.92	5.72	4.	4.	6.	6.
Plate	3.85	3.48	4.	4.	6.	6.
Navel	3.00	2.72	4.	4.	6.	6.
Shank meat	.53	.66	5.	5.	6.	6.
Shank beef	2.60	3.04	2.5	2.5	3.	2.8
Loin	17.55	17.09	14.9	12.5	{ S.17.6 P.23.1	16.
Round	17.74	18.88	7.	7.		12.
Rump	5.19	4.78	7.	7.	10.	10.
Flank steak	.66	.58	10.	10.	12.5	12.5
Flank beef	2.16	1.67	5.	5.	6.	6.
Cod fat	1.98	1.56	3.5	3.5	3.5	3.5
Suet	3.48	4.18	3.5	3.5	3.5	3.5

NOTE: S, sirloin; P, porterhouse.

It will be observed that the carcasses were cut up into a greater number of parts than result from the regular method of cutting explained in the previous chapter, but the differences in the cuts are not great enough to prevent a full understanding of the above table.

On the basis of the above figures we are able to determine the relative profits of the beef- and dairy-type steers to the wholesaler or packer. This is shown as follows:

	Beef steers	Dairy steers
Cost of 4 live steers.....	\$242.52	\$170.64
Cost of killing at \$1.50 per head.....	6.00	6.00
Cost of carcasses and offal.....	\$248.52	\$176.64
Received from sale of hides, tallow, and tongue.....	36.13	30.27
Cost of dressed beef.....	\$212.39	\$146.37
Cost of dressed beef per lb.....	.0715	.0583
Actual wholesale returns when beef was sold.....	232.61	179.83
Margin between cost and selling price of dressed beef 20.22		33.46

The last item in the above table is interesting. It shows that there was \$20.22 margin for the beef-type steers and \$33.46 for the dairy-type steers, or a difference of \$13.24 in favor of the dairy-type cattle. If this difference in margins were applied to the live-weight price of the dairy-type steers, their price per cwt. would have been 28 cents higher; in other words the dairy-type steers would have brought 4 cents per pound, instead of $3\frac{3}{4}$ cents.

At a meat demonstration in January, 1904, conducted by Mr. John Gosling, some further important differences were brought out between the cuts from the dairy- and beef-type carcasses. Mr. Gosling is recognized as one of the leading authorities on meats in this country. In grading the carcasses, he placed three of the beef-



FIG. 20.—Dairy-type steer. Holstein steer in the Iowa experiment. His flat ribs, ridgy back, and angular appearance are characteristic of steers of dairy breeding.

type carcasses as No. 1 and the other as No. 2. Two of the dairy-type carcasses were graded No. 2, and the other two as No. 3. The color of the flesh was fairly good in all eight of the carcasses, although in the Jersey carcasses it was somewhat dark. The external color (or color of the fat) was good in all except one, a Jersey, which killed very yellow. The other Jersey killed very white, although, as a rule, carcasses of Jerseys or grade Jerseys are very yellow. The spines in the backbone of the dairy-type carcasses were hard, indicating the early maturity of the dairy type. They were much more cartilaginous in the beef-type carcasses, although the ages were

nearly the same. The fore-ribs from the dairy-type steers were light and lacking in marbling. The Holstein ribs lacked depth, and were very irregular and rough. The dairy-type steers carried more kidney fat or suet; this is a cheap product which increases the dressing percentage, but reduces the value of the carcass when excessive.

The answers to the questions asked at the beginning of the experiment are, therefore, as follows: 1. The gains from pounds of feed consumed are practically the same for both the beef and dairy types. 2. The beef-type steer uses his gains to slight advantage as compared with the dairy-type, placing a slightly greater percentage of his gains in the valuable cuts. 3. The beef-type steer yields the greater profit to the feeder. 4. The dairy-type steer shows the greater amount of offal. 5. The dairy-type steer carries the higher percentage of tallow. 6. As regards the percentage of valuable cuts, there is very little difference; if any, it is in favor of the beef-type steer. 7. The beef-type steer yields cuts that are heavier, thicker, usually covered with whiter fat, nicer in marbling, and a little better in color of muscle. There is no apparent difference in fineness of grain. 8. The low price paid for dairy steers may be due partially to prejudice, and to the greater expense of carrying and selling the low-grade carcasses, but it is chiefly due to an actual inferiority in the carcasses. They are unsatisfactory to the consumer, because they do not furnish thick and well-marbled cuts; they are unsatisfactory to the butcher, because they furnish low-grade carcasses which are difficult to dispose of; and they are decidedly unsatisfactory to the feeder, because they yield him little or no profit, and both breeder and feeder waste their time in producing such a type of steer for beef purposes.

In an earlier experiment at the Iowa Station, James Wilson and C. F. Curtiss found the quantity of fat about the internal organs of fat steers of the various breeds to be as follows:

Breed	Average dressed weight	Loose tallow	Per cent of loose tallow to beef
Shorthorn	1,092	145	13.3
Hereford	1,022	129	12.6
Red Polled	990	125	12.6
Galloway	1,088	147	13.5
Angus	1,137	157	13.8
Devon	815	123	15.0
Swiss	1,017	119	11.7
Holstein	862	155	17.9
Jersey	880	166	18.8

This table gives further evidence of the tendency of the dairy breeds to deposit proportionately more fat about the intestines,

paunch, kidneys, and caul. Experiments at the Kansas Station substantiate the results of the Iowa investigations.

Why the dairy steer lacks thick flesh.—The experimental results set forth above emphasize the lack of thickness in the cuts from the dairy steer. In other words, the dairy steer is decidedly lacking in muscular development. Mr. John Gosling continually emphasized this point in his annual meat demonstrations at the Iowa State College. He has conclusively shown that there is a very



FIG. 21.—Carcasses of beef and dairy calves. These calves were slaughtered when less than a week old. Neither carcass showed any degree of fat. Note the muscling in round, rump, loin, rib, shoulder, arm, and neck of the beef calf on the left as compared to the dairy calf on the right.

marked difference in the amount of muscle or lean meat present at birth in calves of dairy ancestry as contrasted with those of good beef breeding, and he has also shown that from a practical standpoint, at least, feeding does not increase the relative proportion of muscle in the make-up of an animal. His demonstration in January, 1918, included a beef calf and a dairy calf, less than a week old, which were not selected for veals, but were used to demonstrate the

vast difference in the natural flesh or muscle present at birth in these two types of cattle. The accompanying illustrations show the difference. There was no visible fat on either of them, but the beef calf was thick, plump, and rounding, with muscles like the breast of a quail, while the dairy calf was flat and thin in all parts. The beef calf was thick in neck and arm, broad of back and loin, full in rump, bulging in thighs, and carried his beef to the hocks. The dairy calf



FIG. 22.—Carcasses of beef and dairy calves. Back view of carcasses shown in Fig. 21. Beef calf on left, dairy calf on right. Note the rounds, rumps, loins, backs, shoulders, and necks. The marked difference in muscling inherited by these two calves is plainly evident.

was scrawny in his neck, ridgy along the spine, narrow and shabby over the rump, and light and tapering in his rounds. The evidence is unquestionable. Fat can be put on by feeding, but the muscle comes only by inheritance. The dairy calf is “born wrong” from a beef standpoint, and no known method of feeding and management can correct its deficiency.

Henry and Morrison of the Wisconsin Station discuss the comparative merits of beef-type and dairy-type steers as follows:¹

¹ Feeds and Feeding, 1915, p. 443.

"Beyond that which can be expressed in figures or stated percentagely lies that indefinable something described by the word 'quality' which enters into all objects of barter. No one can compare a bunch of well-fed beef-bred steers with one representing the dairy breeds without being impressed by a difference not measured by the scales. . . . The matter at issue may be illustrated by a condition in the fruit world: No orchardist will hold that the Baldwin apple tree necessarily grows faster than the seedling apple tree, or that it will make wood and fruit on less material from soil and air. Neither will he hold that Baldwin trees necessarily yield more barrels of fruit than seedlings, nor that a given measure of Baldwin apples contains more juice or human food than the same measure of common seedling apples. Fruit growers do rightfully assert, however, that the market wants Baldwin apples and will pay more for them than for common seedling fruit, and that from this judgment of the market, be it reasonable or unreasonable, there is no appeal. Beef cattle have been bred for meat production—it would be passing strange if they did not excel for that purpose."

CHAPTER V

AMERICAN CATTLE MARKETS

Producers of beef cattle use various methods of marketing their stock, depending largely on their location and the number of animals to be sold. The principal methods are as follows:¹

1. Cattle may be sold to the local stock buyer or drover for shipment to central markets.

2. They may be shipped to a central market through a co-operative shipping association and sold at the market by a commission firm which acts as the association's agent.

3. They may be shipped direct by the producer to the central market and sold by a commission firm which acts as his agent.

4. They may be sold to local butchers or cattle feeders.

5. They may be sold to a packer buyer in the country or shipped direct to the packing house.

6. They may be slaughtered on the farm and the meat consumed on the farm or sold locally.

In addition to these there are special methods of marketing such as (a) auction sales, (b) selling on the range direct to buyers from a distance, and (c) selling on mail orders.

Over half of the cattle marketed in the United States pass through the central markets.

The large cattle markets of the United States are located in the central part of the country. With the West and Central West on the one hand as the great breeding and feeding ground, and with the East on the other as the chief region of consumption, it is logical that the large markets have a central location. The estimated center of beef production in the United States is in central Kansas, and the center of beef consumption is in western Ohio, over 700 miles eastward. Between these two is the center of beef slaughter in western Illinois.² Following are the 15 largest cattle markets and their receipts of cattle, including calves, for three years:³

¹ Sheets, Baker, Gibbons, Stine, and Wilcox: *Our Beef Supply*, U. S. Dept. Agr. Yearbook, 1921, p. 278.

² *Ibid.*, p. 315.

³ Compiled from *Drovers Journal Year Book of Figures for 1929*.

Receipts of cattle, including calves, at large central markets, 1927-1929

Market	1929	1928	1927
1. Chicago	3,060,495	3,266,867	3,582,823
2. Kansas City	2,177,751	2,210,086	2,470,269
3. Omaha	1,546,433	1,517,754	1,560,973
4. St. Paul	1,424,968	1,489,915	1,582,468
5. St. Louis	1,223,151	1,314,616	1,448,393
6. Ft. Worth	1,089,132	1,211,119	1,286,440
7. Sioux City	839,245	812,742	808,500
8. Denver	624,067	667,201	640,167
9. Pittsburgh	623,191	690,610	838,050
10. St. Joseph	589,664	597,820	640,631
11. Milwaukee	580,777	571,972	622,637
12. Buffalo	490,142	545,092	610,875
13. Indianapolis	428,733	438,501	488,494
14. Oklahoma City	374,564	362,866	383,065
15. Wichita	331,020	394,141	405,401
Totals	15,403,333	16,091,302	17,369,186

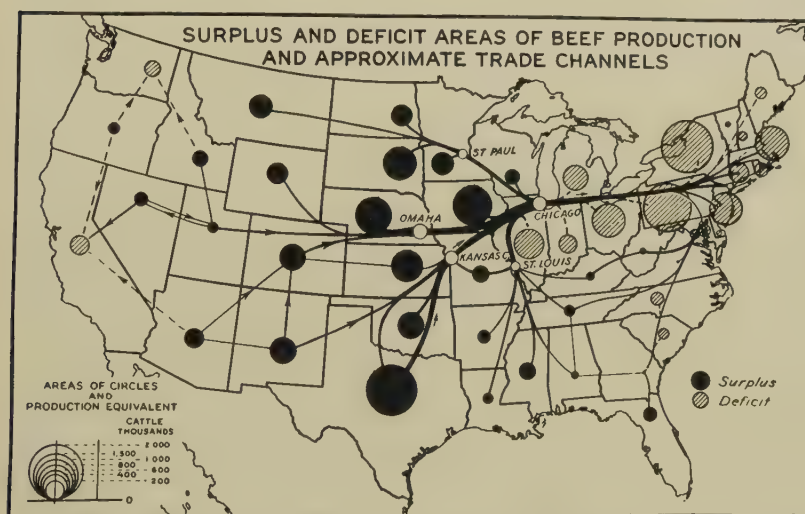


FIG. 23.—Surplus and deficit areas of beef production and approximate trade channels. With the exception of a very small surplus in some southern states, the surplus beef comes from states west of the Mississippi river. Texas, Iowa, South Dakota, Nebraska, Kansas, and Oklahoma produce the greatest surplus. Montana, Wyoming, Colorado, and New Mexico are of considerable importance. Washington and California do not produce enough to satisfy state demand. The greatest deficit areas are in the large population centers in the eastern states, but Illinois, Indiana, and Ohio in the corn belt are also deficit states. This map is based upon number of beef cattle and calves, population, beef consumption, and movement of cattle for the year 1924.

The U. S. Bureau of Agricultural Economics reports that 20,380,000 cattle and calves were received at 65 stock yards in 1929. The 15 markets listed above received 75 per cent of this total.

There are no large cattle markets in other countries which compare with the larger markets in the United States. South American

markets may in time approach our own in size. American packers are now operating plants in Argentina, Brazil, Uruguay, and Paraguay. Packing plants are one of the most essential factors in the creation of large central markets.

The Chicago market, the largest cattle market in the world, received 2,388,422 cattle and 672,073 calves in 1929. Cattle weighing 300 pounds or less are classed as calves. The total value of cattle received at Chicago in 1929, excluding calves, was \$268,055,571. Their average value per head was \$112.23. Their average weight was 1,005 pounds. Their average price per cwt. was \$11.17. The number of cattle received at Chicago direct from western ranges in 1929 was 144,600. Chicago does not receive as many of these as do some of the markets located farther west. Western range cattle

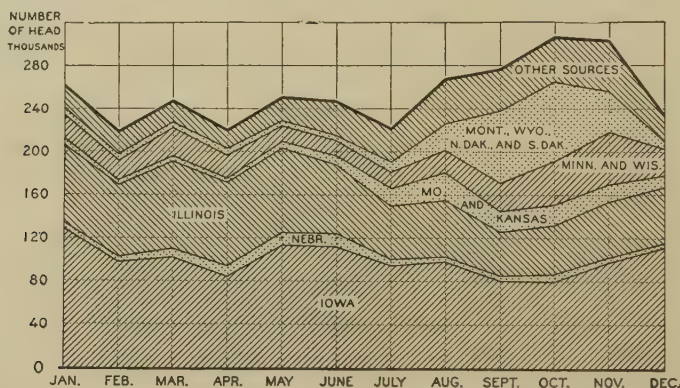


FIG. 24.—State origin of cattle receipts at Chicago, average of 1926 and 1927. Iowa is the greatest source of receipts, Illinois next, with Minnesota, Wisconsin, Missouri, Kansas, and Nebraska of lesser importance. Montana, Wyoming, and the Dakotas market considerable numbers of range cattle at Chicago during the fall months.

direct from the West are marketed at Chicago from July to December inclusive, and they usually constitute about eight per cent of all cattle received during the year. The total value of the calves received was \$12,544,820; their average value was \$18.65; their average weight was 137 pounds; and their average price per cwt. was \$13.60.

Sources of receipts.—The corn-growing area of the Mississippi and Missouri valleys affords the best facilities for the production of meat animals, and this area is tapped at many points by lines of railway centering in Chicago. The corn-fed cattle of Iowa, Nebraska, Missouri, Kansas, Illinois, Indiana, and Ohio, and the grass-fed cattle of Montana, Wyoming, the Dakotas, and Texas, have easy

access to Chicago. Steers are sold in Chicago that were born in Texas, matured in Montana, and finished in an Iowa feed-lot. Sheep often experience similar wanderings before reaching market, but hogs usually come direct from the farm on which they were farrowed.

Average carloads.—Reports of stock yards and railroads show that the average number of meat animals to the carload is for cattle about 25, hogs in single-deck cars about 75, and sheep about 120 per deck. These figures represent mere averages. The number of animals per car varies greatly depending on the age and size of the animals. For example, a stock car 36 feet long will hold 55 calves weighing 400 pounds each, 35 yearlings weighing 700 pounds, 25 cattle averaging 1,000 pounds, 21 cattle weighing 1,200 pounds, or 19 cattle weighing 1,400 pounds each.

Shrinkage of beef cattle in transit.—In an investigation made by W. F. Ward of the U. S. Bureau of Animal Industry,¹ cattle in transit less than 24 hours shrank from 2.05 to 3.91 per cent. Those in transit from 24 to 36 hours shrank from 3.46 to 6.37 per cent. Those in transit from 36 to 72 hours shrank 3.88 to 5.40 per cent. Those in transit over 72 hours shrank from 3.96 to 7.00 per cent. These figures are based on weight at origin and “filled” weight at market.

The fill.—Commission men who sell live stock on the large markets are always careful that the cattle consigned to them get plenty of hay and water before they are offered for sale. This is called the “fill,” and it is important because it has a quieting effect on the cattle, corrects the gaunt appearance caused by shipping, and adds weight to the animal. The buyer estimates the fill in various ways, particularly by the degree of paunchiness. Hence the fill does not constitute a fourth factor of the dressing percentage, but is included under paunchiness. On hot days when cattle take a heavy fill of water, buyers stay off the market as long as possible.

Monthly weights of Chicago cattle.—The writer tabulated the average monthly weights of cattle at Chicago for ten years, 1920 to 1929 inclusive, and then determined the monthly averages for the entire ten-year period. The general average for the ten years was 992 pounds. Following are the ten-year averages for all months:²

¹ U. S. Dept. Agr. Bul. 25, pp. 73, 74.

² Compiled from Drovers Journal Year Books of Figures.

Average monthly weights of cattle at Chicago for ten years

Month	Weight Pounds	Month	Weight Pounds
January	990	July	998
February	996	August	996
March	992	September	988
April	997	October	984
May	993	November	984
June	999	December	(982)

Seasonal variations in receipts and sale of cattle at Chicago.—The accompanying chart shows the average monthly receipts of cattle, excluding calves, at Chicago for ten years. Largest receipts occur in September, October, November, December, and January, especially in October and November. Large receipts at this season are due to the heavy run of grass-fed cattle in the fall. (During the

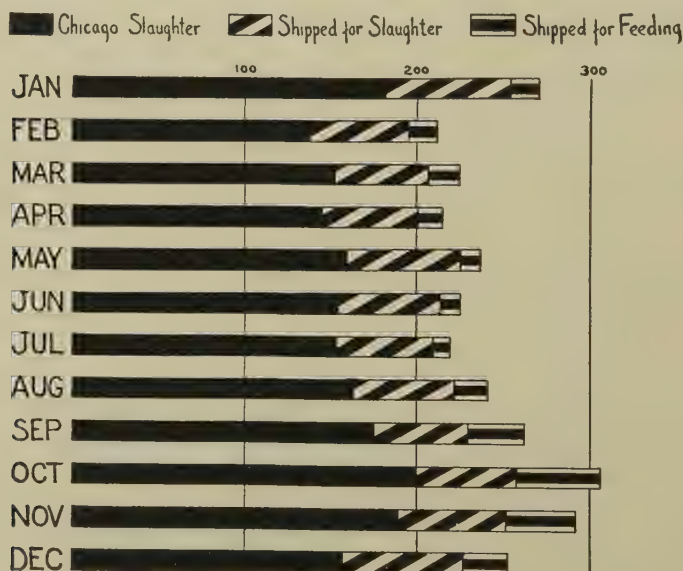


FIG. 25.—Average monthly receipts and shipments of cattle, excluding calves, at Chicago in thousands for ten years, 1920-1929. The total length of each bar represents average monthly receipts. The divisions of the bar represent the average number of Chicago cattle sold monthly for local slaughter, shipment to other points for slaughter, and shipment to the country for feeding (or breeding) purposes.

ten years included in this study, largest receipts occurred in October six times, in November twice, in December once, and in January once.) About 38 per cent of the year's total receipts arrive during the last four months of the year, and about 47 per cent in these

months and January.¹ From February to July inclusive, monthly receipts are smaller and quite uniform. (These months included all of the low points during the ten years.) Over 40 per cent more cattle are received at Chicago in October than in April, but monthly receipts of cattle are less variable than those of sheep or hogs.

As shown in the chart, about 67 per cent of the cattle received at Chicago are slaughtered there, 24.5 per cent are shipped to other points for slaughter, and 8.9 per cent are returned to the country for feeding (or breeding) purposes.² In September, October, November, and December, the movement of feeders is at its height. During these four months 13.3 per cent of the cattle received at Chicago are sold for feeding purposes, and these constitute over 56 per cent of the total number of feeder cattle shipped from Chicago during the year. The feeder outlet helps to maintain prices for all cattle during the season of large receipts. Most feeders are fattened and returned to market before June 1, thus helping to maintain supplies during the season of light receipts.

Movements of live stock are largely controlled by such factors as the limits of the grazing season, the maturity of crops for feeding, distribution of labor, etc., and it is not advisable that monthly shipments of cattle to market shall be equalized, yet it is at the same time true that a more even distribution is, within limits, desirable to both producer and consumer.

Early cattle markets.—A century ago cattle markets were small and largely local in character. The "West" at that time was comprised of Ohio, Kentucky, and Indiana. There were no railroads, no live-stock cars, no refrigerator cars, no steamships, and no large live-stock markets. Every large town had its own stock yards or cattle market to which cattle were driven from the surrounding country and sold to butchers. In time, New York, Philadelphia, Boston, and Baltimore became rather large markets, and in some instances cattle were driven long distances to supply them.

Early methods of transportation.—This was before the days of railroads, and even after the railroads came, very few live animals were carried until about 1860. Prior to 1850, it was the general practice to drive live stock to market on foot. At that time, in many parts of the country, pasturage was free along the routes, and the animals were driven by easy stages, reaching market without very much depreciation. George Renick, of Ohio, was perhaps

¹ The same is true of average monthly receipts at 67 stock yards in the United States.—U. S. Dept. Agr. Yearbook, 1921, p. 286.

² At 67 markets about 20 per cent of all cattle and calves are sold for feeding.—U. S. Dept. Agr. Yearbook, 1921, p. 286.

the first man to find an outlet for cattle fattened in what was then "The West." In 1805, against the advice of his neighbors, he successfully drove 68 head of cattle to Baltimore and disposed of them at a profit.¹ This gave a great impetus to the western cattle business of that time and afforded a means of marketing corn. Drovers of 150 to 500 cattle, mostly four or five-year-old steers, were fattened on corn and driven overland in spring and summer. From 1840 to 1850 Ohio and Kentucky supplied most of the corn-fed cattle on eastern markets.²

One route from Kentucky to New York City covered about 800 miles and required over ten weeks to complete it. Drives to the eastern seaboard were made from as far west as Iowa, and even Texas cattle passed eastward in this manner. Sheep were driven across country also, notably from Vermont to Virginia. Large numbers of hogs were driven to market, but they were a more active type than the modern fat hog. By 1860, few hogs were driven any considerable distance.³ Today we do not even drive hogs from the farm to the shipping point, but haul them in trucks or wagons.

The advent of transportation by rail ⁴ marked a decided turning point in the live-stock industry and the live-stock markets. Western cattle were then sold on eastern markets throughout the year. Producers of grass-fattened cattle in the East could not compete with them, and Ohio feeding also declined in competition with the cheaper grass cattle of Illinois. By 1860 the railroads extended west of the Mississippi, and central Illinois and eastern Iowa became a great cattle feeding district. Then came the development of the range cattle industry of the Great Plains from 1870 to 1885, reaching its maximum development between 1890 and 1900.

Development of large markets.—As long as markets were simply the scene of barter in live animals for local use, no large markets were developed. About 1820 pork packing was begun, and this furnished the first impetus to the creation of large markets of more than mere local importance. Pork could be pickled, salted, and smoked, and the fat rendered into lard, and the products thus produced could be shipped to distant points. As these products met with good demand, pork packing was the natural beginning of a vast meat-manufacturing business, tending to centralize the hog markets, and much increase them in size. So far as cattle were

¹ Alvin H. Sanders: *Shorthorn Cattle*, 1900, p. 192.

² U. S. Dept. Agr. Yearbook, 1921, p. 233.

³ Frank Andrews: *Cost and Methods of Transporting Meat Animals*, U. S. Dept. Agr. Yearbook, 1908, p. 228.

⁴ U. S. Dept. Agr. Yearbook, 1921, pp. 234-238.

concerned, however, the development was not parallel. Outside of an article known as "barreled beef," which was put down in salt, packers had found no method of handling beef as they did hogs. Not until the era of the refrigerator car, beginning in 1875, were cattle of much interest to packers, and not until that time did the large cattle markets reach a maximum development.

The cattle markets of the United States migrated from east to west, following closely upon the development of the country. It was at one time believed that Albany was to be the final gateway for western cattle. Next Buffalo, Pittsburgh, and Cincinnati were in turn regarded as the future great market of the country; but eventually it became evident that Chicago, by virtue of location and railroad facilities, was to become and remain the largest cattle market in America. This fact was clearly established by 1870.

With the development of the corn belt and western range cattle industry, markets established at various points on the Great Lakes and along the Mississippi and Missouri rivers became the most important. This is a natural result of the fact that the states west of the Mississippi produce about 80 per cent of our beef cattle, 50 per cent of our hogs, and 75 per cent of our sheep, while the states east of the Mississippi consume about 68 per cent of our total meat production. Most of the principal slaughtering points and principal markets are near the areas of large production because dressed meat may be shipped more economically than live animals, due to lower freight costs and elimination of deaths, injuries, bruises, and shrinkage in transit.¹

Chicago's early cattle trade.—The history of Chicago as a cattle market extends back many years to the time when a few hundred animals were driven in to supply the garrison at old Fort Dearborn. It was not until the advent of railroads, however, that Chicago took prominence as a live-stock center. When railroad communication with the Atlantic seaboard was established and lines were built from Lake Michigan toward the Mississippi, a revolution was brought about. Half a dozen stock yards were located in various parts of the city, and when these became glutted, the cattle were grazed on the surrounding prairie until a price could be realized. Mess pork and barreled beef were staple articles known to the trade under the appetizing names of "sow belly" and "salt horse." Dressed beef was then unknown to commerce, artificial refrigeration was not even speculated upon, the refrigerator car

¹ Studies in Live-Stock Marketing, The Geography of Meat Production and Consumption, Commercial Research Dept., Swift and Company, Chicago, Jan., 1922.

existed merely as an idea, if at all, and the canning of meats had not been attempted. Armour was not a prominent name at that time, Swift had not yet discovered Chicago, and nearly every concern then engaged in the manufacture of meats has since gone out of business.

Founding of the Union Stock Yards.—Prior to 1865, Chicago had several stock yards of minor importance and located in different sections of the city. The first was the old Bull's Head Stock Yards, opened in 1848. In 1865, John B. Sherman organized the Union Stock Yard and Transit Company, which purchased 320 acres at 39th and Halsted streets and opened the present Union Stock Yards, thus laying the basis for a greater live-stock trade at Chicago. In 1876 the market could accommodate at one time 20,000 cattle, 100,000 hogs, 15,000 sheep, and 1,000 horses—in all, 136,000 animals. The Kansas City Stock Yards was opened in 1871, the National Stock Yards, located in Illinois, but known as the St. Louis market, was opened in 1872, and the Omaha Stock Yards was established in 1884.¹

The Union Stock Yards today.—The Union Stock Yard and Transit Company receives, unloads, counts, yards, feeds, waters, weighs, and delivers or reships live stock, but neither buys, sells, nor slaughters animals. It is a great transportation and marketing corporation, which connects all of the 26 railway systems entering Chicago with the Union Stock Yards, and provides unloading platforms, chutes, pens, buildings, and all necessary facilities for doing an immense daily business in handling live animals, but takes no part in the transaction of the market. Stock yard companies derive their revenue from pen rentals, charges for feed, and rental of office space.

The Chicago yards now occupy an area of 500 acres, 450 of which are paved. Separate accommodations are provided for each kind of stock; sheep and hogs are kept in sheds of two or more stories each, and cattle occupy open pens holding from one to several carloads. These yards would hold at one time 75,000 cattle, 125,000 sheep, 300,000 hogs, and 6,000 horses and mules. Since 1900, a yearly average of more than 15 million animals have found a cash market at Chicago. Since 1865, over 149 million cattle, 18 million calves, 421 million hogs, 178 million sheep, and 3 million horses and mules have been handled, making a grand total of over 770 million animals, the value of which was more than 18 billion

¹ Arthur C. Davenport: *The American Live Stock Market—How It Functions*, 1922, p. 16.

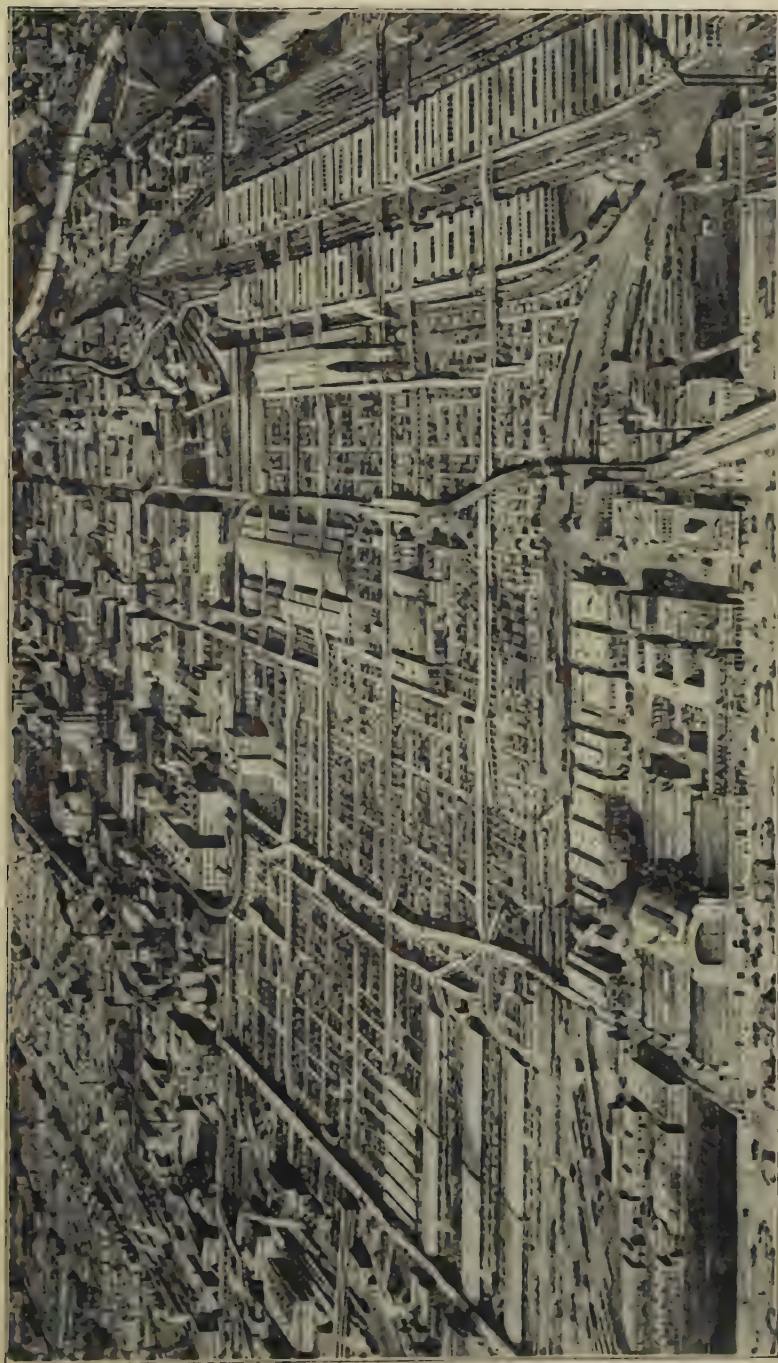


FIG. 26.—Union Stock Yards, Chicago. In the foreground is Halsted Street, the International Amphitheater, and the Stock Yard Inn. To the left and rear of the Amphitheater is the horse sales section. In the distance is "Packing-town" surmounted by lofty smoke-stacks. The Exchange Building, sheep barns, hog sections, and the large area of cattle pens may all be easily seen. Note the long overhead cattle chutes connecting distant parts of the yards, the numerous railway tracks, and the elevated railway which crosses the yards and encircles the center of Packingtown.

dollars. The business sometimes amounts to \$5,000,000 in a day, and averages well over \$1,500,000 for every business day of the year. Not infrequently 2,000 carloads of stock are received on Monday, the largest market day. Prices established on this leading market form the basis of values for live stock at other markets and throughout the country.

Essential factors in a large market.—Arthur C. Davenport, manager of the Chicago Daily Drovers Journal, states¹ that the more essential interests which promote and make possible the development of large live-stock markets are transportation companies, stock yards corporations, commission houses, packing companies, local butchers, order buyers, export buyers, speculators or scalpers, traders or dealers in feeders, banking houses and loan companies, and daily market newspapers. Order buyers buy fat stock for packers and butchers located at a distance from the market. Export buyers make purchases for shipment to foreign countries. Speculators and traders buy all kinds of stock that offers a chance for resale at a profit. They frequently buy mixed loads, sort them, and resell to various classes of buyers. Traders are speculators who deal largely in feeder cattle, sheep, and pigs.

Commission firms rent blocks of pens from the stock yards company and sell the live stock consigned to them. They also buy feeders and fat stock on orders. The commission company remits to the consignor the amount received for animals sold, less charges for freight, yardage, feed, commission, insurance, and any other marketing expenses. As success in the commission business rests upon soundness of judgment, honesty, and skill, very few consignors undertake to do their own selling, but do it more profitably through the medium of the commission man.

The live-stock exchange is the organization of the commission firms operating on the market. It fixes commission charges, adjusts disputes, enforces rules to prevent fraud, and handles claims for loss and damage of live stock. The live-stock exchanges at various markets are in turn members of the National Live-Stock Exchange. Speculators and traders are not eligible to membership in the live-stock exchange. They have a similar organization of their own known as the "traders' live-stock exchange," and there is also a National Traders' Live-Stock Exchange.

How cattle are sold.—When cattle are yarded in the pens of the commission company and have been fed and watered, they are offered for sale by a representative of the commission company.

¹ The American Live Stock Market—How It Functions, 1922, p. 19.

Packer buyers, order buyers, export buyers, local butchers, or speculators may buy them. All sales of cattle, sheep, and hogs are made at private treaty. The salesman names his price, the buyer offers his bid, and the salesman accepts or rejects it. All live stock except milkers and springers, horses, and mules are priced and sold by the hundredweight, and the nickel is the smallest denomination in which prices are quoted. As soon as a sale is made the cattle are driven to the scales and weighed by the stock yards company. On the scales ticket are recorded the weight, number of animals, and price per cwt., and the names of the consignor, commission firm, and buyer. All sales are for spot cash, and most of the live stock is sold on the day of arrival.

Charges for yardage, feed, and commission.—Yardage at Chicago costs 35 cents per head for cattle and 25 cents for calves. Hay costs \$30 to \$40 per ton. The commission charges for selling cattle at Chicago are as follows: Cattle in car lots, 20 head or less, \$17, and 75 cents per head for each additional head over 20 head, with a maximum of \$21. Calves in car lots, single deck, 50 head or less, \$17, and 30 cents per head for each additional head over 50 head, with a maximum of \$22; double deck, 70 head or less, \$23, and 30 cents per head for each additional head over 70 head, with a maximum of \$28. Less than 14 cattle in one car, 90 cents per head. Less than 40 calves in one car, 40 cents per head.

Government supervision.—On August 15, 1921, Congress passed the Packers and Stock Yards Act which gives the Secretary of Agriculture supervision of packers and all others engaged in business at public stock yards. In his annual report for 1921¹ Secretary Henry C. Wallace states that by this act "the packers are prohibited from any unfair, unjustly discriminatory, or deceptive practices or devices," and "commission merchants, persons furnishing stock yards services, and dealers at yards are required to establish, observe, and enforce just, reasonable, and nondiscriminatory rates." Fines are provided as penalties. Packers and others may appeal to the courts in case of dispute. The rulings of the Secretary are not final unless upheld by the courts.

Cooperation in live-stock marketing.—During recent years the cooperative movement in the production and marketing of agricultural products has made great strides in the United States. In the live-stock industry this movement has taken the form of cooperative shipping associations, commission companies, wool pools, bull associations, cow-testing associations, consignment sales of purebred

¹ U. S. Dept. Agr. Yearbook, 1921, pp. 33, 34.

live stock, and breeders' associations for collective advertising, selling, etc. Producers have also cooperated to establish and operate creameries, packing plants, and other manufactures of live-stock products.

The cooperative live-stock shipping association is an organization of producers tributary to a local shipping point. The association appoints a manager who loads and ships carload lots of stock made up by members, receives reports and proceeds of sales, and apportions the proceeds to members. For his services the manager receives a commission on each carload. Each member's animals are marked to distinguish them and when sold at the market they are weighed separately, and, if necessary, are also sold separately. If the carload is uniform, separate selling may not be required. This system gives the small producer with a few animals the opportunity to sell his stock on the central market. Without it the small producer must sell his stock locally, either to the local stock buyer, local butcher, or nearby feeder. Shipping associations often buy feed cooperatively, and sometimes buy live stock cooperatively.

The first cooperative shipping association in this country was the Farmers' Shipping Association of Superior, Nebraska. This association was formed in 1883 and has been in continuous operation since. At present it is estimated that from 4,000 to 5,000 organizations of producers in the various states are shipping live stock in a cooperative way. Most of these are in the middle western states.¹

In recent years in some of the states, particularly in Ohio, the county-wide type of association has been organized. Such associations provide for shipping stock from practically every railroad loading point in the county where the necessary facilities are available. A county manager is employed, who is responsible for listing, receiving, marking, grading, weighing, and consigning the stock and receiving and prorating the returns. He usually has an assistant at each shipping point, who attends to all the details of receiving and loading the stock for shipment.¹

Cooperative live-stock commission companies are a more recent development. The cooperative commission company is owned and controlled by the cooperative shipping associations and individual producers tributary to the market at which it is located. The company has a salaried manager who employs assistants, salesmen, and clerks and conducts the business along the same lines as the privately owned commission company. Some cooperative com-

¹ U. S. Dept. Agr. Farmers' Bul. 1502, Cooperative Livestock Shipping Associations, p. 2.

panies charge the same commission rates as the private companies, and some charge lower rates. In either case the profits over and above dividends on capital stock and requirements of the sinking fund are prorated to members according to the number of cars consigned by each of them. This saving in commission expenses is the principal purpose of the cooperative commission company.

Twenty-six cooperative sales agencies on 20 markets in 1928 received from local shipping associations and individual shippers approximately 12,000,000 animals which were sold for about \$275,000,000. In addition to the animals sold, these cooperative enterprises purchased nearly 350,000 animals for farmers wanting stockers and feeders. These animals had a market value of nearly \$8,000,000. Twelve of the cooperative agencies are branches or affiliations of the National Live Stock Producers' Association, nine are creations of the Farmers' Educational and Cooperative Union, and five are independent enterprises.¹

There are three cooperative agencies operating on the St. Paul market, two each at Chicago, St. Louis, Kansas City, and Sioux City, and one each at Buffalo, Cincinnati, Cleveland, Denver, Detroit, Evansville, Ind., Fort Worth, Indianapolis, Milwaukee, Omaha, Peoria, Pittsburgh, St. Joseph, Springfield, Mo., and Wichita.¹

The largest and probably the most successful cooperative live-stock commission company is the Central Cooperative Association at the St. Paul market which sold 20,706 cars of stock in 1929 for a total of \$36,121,494. Its operating expenses amounted to \$11.10 per car. It charged \$2 to \$5 less commission per car than the private companies at St. Paul and declared a patronage refund to its members of \$103,602 for the year, or about \$5 per car. It has about 725 shipping associations which are member stockholders, also about 3,600 individual producer members who market directly through the association. It handles more business than any other sales agency, either cooperative or private, on any market in the United States.² With efficient management the success of the cooperative live-stock commission company seems assured.

From farm to market.—Briefly, the steps by which cattle usually pass from the farm and feedlot to the central market, and through the market and to their final destination, are as follows:

1. Driven from farm to shipping point.
2. Loaded on car.

¹ U. S. Bur. Agr. Econs., Agricultural Cooperation, Feb. 23, 1929.

² Information to the author.

3. Station agent makes out way bill indicating to what market shipped and to whom consigned.
4. Car delivered by railroad to terminal railroad at destination.
5. Terminal railroad spots car at market's unloading chutes.
6. Stock yards company immediately unloads, counts, records, and delivers the cattle to commission company at its pens, and feeds and waters the stock in accordance with instructions from commission company.
7. Commission company sells to packer buyer, order buyer, speculator, trader, export buyer, or local butcher.
8. Stock yards company then weighs, counts, records, and delivers or reships the animals to their final destination.
9. Commission company immediately remits proceeds of sale to owner, less cost of freight, yardage, feed, commission, and other charges.
10. Commission company pays for freight, yardage, feed, and other marketing charges, having retained from proceeds of sale an amount sufficient to cover these items and its commission.

Development of the packing industry.—The term "packer" originated in the early days of the meat business in this country, when the packing or putting down of cured meats, especially pork products, was the principal business of all large wholesale butchers. The first regular packer in the West was Elisha Mills, an easterner who began at Cincinnati in 1818.¹

As previously mentioned, hogs benefited from the packing operations of early days to a greater degree than cattle. Packers could not handle beef on a large scale until the invention of artificial refrigeration and the substitution of the tin can for the oak barrel. Arthur Libby introduced canned corn beef in 1874, which was followed by many other palatable canned preparations. James Macdonald, of Aberdeen, Scotland, a noted agricultural writer who visited the Chicago stock yards in 1877, states² that about 250,000 cattle were slaughtered at Chicago in 1876, and that more than three-fourths of these were handled by two firms, the Wilson Packing Company and Libby, McNeill and Libby. He further states that about half of the beef was canned and the remainder put down in barrels and tierces. "Large as these beef-packing establishments are," writes Macdonald, "the pork packeries throw them

¹ Rudolf A. Clemen, Economics Dept., Northwestern University: Development of American Meat Packing, National Provisioner, Feb. 12, 1921, p. 18.

² Food From the Far West, Edinburgh, 1878, p. 187.

far into the shade." He reports ten times as many hogs slaughtered at Chicago in 1876 as cattle.

The history of the meat business is closely interwoven with the history of the live-stock markets, the two enterprises being mutually dependent upon each other. The Chicago market benefited not only from its location and shipping facilities, but to a great extent also because of the large packing interests which centered there. That part of the yards where the group of packing plants is located is called "Packingtown." Some fifteen or more companies operate the numerous plants in Packingtown and immediate vicinity.

The numbers of cattle and calves slaughtered by leading Chicago packers in 1928 and 1929 were as follows:¹

Chicago slaughter of cattle and calves by leading packers

Company	Cattle		Calves	
	1929	1928	1929	1928
Armour and Company.....	312,392	326,045	167,006	196,283
Swift and Company.....	296,802	294,911	137,580	184,327
Wilson and Company.....	234,981	238,206	89,026	93,074
Morris and Company.....	127,280	133,131	42,162	46,981
Hammond Company.....	112,310	108,387	.....	.....
Anglo-American Company....	58,916	52,949	.....	.....
Libby, McNeill and Libby....	39,211	49,033	.....	.....
Totals	1,181,892	1,202,662	435,774	520,665

The refrigerator car.—There have been three eras in the evolution of the American meat industry: (1) The era of pickled meats, such as hams, pork products generally, and salted beef; (2) the era of artificial refrigeration and the refrigerator car; (3) the era of complete utilization of by-products. The supremacy during the first era was first at Cincinnati, but it shifted to Chicago in the early sixties. In the early days, packing houses were operated only during the winter months, and no meats were packed in summer until large chill rooms were made possible through successful artificial refrigeration. In 1875, Philip D. Armour erected in Chicago the first really large-scale chill room in the world, although small ice boxes had previously been used by others. As early as 1868 a refrigerator car had been invented, but it was not until 1869 that the first through-line railroad was opened between Chicago and New York so that cars of western meat could be shipped through to eastern markets without unloading en route.

¹ Drovers Journal Year Book of Figures for 1929.

In 1869 the first consignment of dressed beef was shipped from Chicago to Boston, but the attempt was not successful. In 1875, G. F. Swift, who had come to Chicago that year, and who founded Swift and Company, fitted up a car and shipped it east successfully. Thereupon, this branch of the packing business was entered into rapidly, thus eliminating freight charges on the 40 to 44 per cent waste of the live animal, the shrink on cattle during the long haul, the expense of feeding and watering en route, and the loss of those which died in transit.

Pioneer exports of beef.—Still greater savings have been effected by changes in the export trade. John J. Bate, of New York, was the first to undertake shipments of dressed carcasses to Europe. On February 11, 1875, he made a small shipment to Liverpool which arrived in good condition. This was followed, on June 6, by a larger shipment, and on August 10, a still larger consignment to Liverpool was made, all arriving in good condition. In October, 1875, Timothy C. Eastman began his first shipments of fresh beef from America to England; Mr. Eastman is generally regarded as the pioneer in this enterprise. He built up a very large business which continued many years. Others entered into the industry, and shipments were made from New York, Philadelphia, and Portland, Me. The business increased rapidly, meats being successfully shipped from Chicago to England. A saving of more than one-half in shipping expenses is effected by exporting dressed beef rather than its equivalent in live animals. From Argentina to England, over two-thirds of the live-weight expenses are saved by sending dressed beef.¹

Branch houses and car routes.—Another important factor in the growth of the American packing industry has been the establishment of wholesale or branch houses with refrigerators in all leading centers of meat consumption. Swift and Company has over 400 branch houses, most of which are in eastern cities and towns. Through daily reports from its branch houses the packing company gets its best information concerning the consumer market, and from this information the buying policy is determined.

Hundreds of smaller towns are supplied by special refrigerator cars, known as "route cars," which make regular trips and deliver meats ordered by local dealers. This method of distribution has been used by Swift and Company since 1890. In 1928 Swift operated 600 car routes radiating from its 17 plants in the United States, and supplying over 7,000 towns.²

¹ U. S. Dept. Agr. Yearbook, 1908, p. 244.

² Swift and Company Year Book, 1929, pp. 21-32.

The modern packing company.—No better illustration of the growth of the packing industry can be had than that afforded by the rise and present proportions of one of the large packing companies at Chicago. In 1885, this concern was capitalized at \$300,000, in 1886 at \$3,000,000, in 1896 at \$15,000,000, later at \$35,000,000, in 1906 at \$50,000,000, and in 1929 it was \$150,000,000. It has packing plants in several American cities and also in South America and Australia, but the figures here presented apply only to its business in the United States. It has over 400 branch houses in the principal cities and towns of the United States, and owns and operates 6,000 refrigerator cars. Its output of meat of all kinds in one year was almost 3 billion pounds. Its sales in 1929 totaled over one billion dollars. It paid \$543,975,887 to live-stock producers. Its profit on meat sales is only about 2 per cent, but the capital is turned over several times during the year. It paid its 45,000 stockholders an 8 per cent dividend amounting to \$12,000,000. In 1929 its Chicago plant converted into dressed meat 297,000 cattle, 138,000 calves, 940,000 sheep, and 772,000 hogs.

According to the 1920 census, 1,305 packing establishments in the United States paid out in 1919 for raw materials, chiefly live stock, \$3,774,901,000, and their manufactured products had a total value of \$4,246,290,000.

Federal inspection of animals and meats is rigid and includes all animals at central markets and all carcasses and packing-house products intended as food. This safeguards the public health and has been an important factor in gaining admission for our meats into foreign countries. Dr. George Ditewig of the Meat Inspection Division, U. S. Bureau of Animal Industry, describes the federal inspection as follows:¹

“Federal meat inspection is conducted under the provisions of the act of Congress of June 30, 1906, commonly designated the Meat Inspection Act, the purpose of which is to prevent the use, in interstate or foreign commerce, of meat and meat food products which are unfit for human food. In brief, this law authorizes the Secretary of Agriculture, at his discretion, to make, through inspectors, an *ante-mortem examination and inspection* of all cattle, sheep, swine, and goats to be slaughtered and the meat and meat food products of which are to be used in interstate or foreign commerce; it also directs the Secretary to make, through inspectors, a *post-mortem examination and inspection* of the carcasses and parts thereof, and an examination and inspection of all meat food prod-

¹ U. S. Dept. Agr. Yearbook, 1915, p. 273.

ucts, of all such animals prepared for human consumption at any slaughtering, meat canning, salting, packing, rendering, or similar establishment for transportation as articles of interstate or foreign commerce. If, on such post-mortem inspection, the articles are found to be wholesome, within the meaning of the law, it is the duty of department inspectors to mark them 'Inspected and passed,' and if not, to mark them 'Inspected and condemned.' Condemned articles are required to be destroyed for food purposes in the presence of an inspector."

During the year 1929, the federal inspection conducted at 801 packing plants and other similar establishments throughout the country resulted in the condemnation at slaughter of .75 per cent of cattle, .19 per cent of calves, .30 per cent of hogs, .15 per cent of sheep, and .37 per cent of goats. The average of all animals was .32 per cent.¹ Meat condemned after slaughter, including all meat and meat food products, prepared and processed, amounted to .09 per cent. Nothing has done more to instill confidence in packers' meats than has the rigid governmental inspection. Packers losses are frequently heavy on account of this inspection, mainly owing to tuberculosis. Crippled animals may go into the food supply. Diseased animals, diseased meats, and dead animals are consigned to the rendering tank, the products of which are grease, glue, and fertilizer.

Government inspection at the markets is also conducted along other lines to prevent the spread of disease among animals. Arthur C. Davenport states ² that all animals shipped from public markets, unless for immediate slaughter or steers for feeding, are subject to inspection and treatment. Cattle over six months old going to the country for breeding purposes must be tuberculin tested. Iowa and Illinois require that all feeding cattle except steers must be branded on the jaw with an "F" to insure that they will not be retained for breeding. Cattle or sheep having scabies, or cattle infested with the fever tick, are dipped before shipment. All hogs shipped out must be vaccinated for cholera and dipped or sprayed in a standard disinfectant under government supervision. Practically all public yards maintain quarantine divisions for yarding diseased animals.

Brand inspection.—At markets where western cattle appear in numbers, western cattle growers' associations and the state of Montana maintain brand inspectors who examine all brands and

¹ Computed from Report of Bureau of Animal Industry, 1929.

² The American Live Stock Market—How It Functions, 1922, pp. 157-159.

cut out and sell separately all cattle not the property of the shipper. The proceeds of such sales are returned to the rightful owners. This prevents the rustling of cattle on the range and their sale at large markets, and recovers stray cattle overlooked by shippers. W. F. Wilcox, of Montrose County, Colo., states¹ that over 85,000 brands are on record in Montana alone, and that Colorado and New Mexico each have recorded over 40,000, Wyoming over 21,000, Arizona 20,000, California 15,000, North Dakota 10,000, South Dakota 12,000, and Oregon 8,500. In Texas brands are recorded by the counties. Many of the recorded brands are no longer in use, but the figures indicate that a brand inspector must have a good memory, even though he examine the shipments from only one state.

¹ Brands and Branding in the West, Breeder's Gazette, Apr. 7, 1921, pp. 639-641.

CHAPTER VI

FASHIONS IN MARKET CATTLE

England and America, and other countries inhabited by English-speaking people, lead in meat consumption, especially in beef consumption. "The roast beef of old England" is well known as characteristic of the Englishman's culinary tastes, but Youatt records that in the time of Henry VIII the English people were "strangers to beef and mutton." The consumption of beef was confined principally to the summer months, and it sold at a very low price, so that there was no encouragement toward the production of beef cattle or beef. Instead, cattle were valued for milking purposes and most of all for field labor, and not until they had served a number of years as draft animals were they fattened for the butcher. Six-year-old oxen were sold from the plow to be fattened and then brought \$50 to \$75. There is record of an ox that was worked until fifteen years old and then fattened fairly well. Those most certainly were not days when men talked of baby beef. Size, usefulness for field labor, and for dairy purposes were the qualities chiefly sought.

Prior to the close of the eighteenth century, there was little exercise of care in the breeding of cattle, and feeding was an unknown art. But conditions gradually became better; England became more prosperous and wealthy, and there arose a demand for more and better beef, for which higher prices were paid. This impetus gave rise to the formation of the breeds of beef cattle, all of which originated in England and Scotland, unless we consider the Polled Shorthorn and Polled Hereford real American breed creations, which, of course, they are not, being the result of slight modifications of English breeds.

Size and type of early beef cattle.—When beef production was begun in earnest, more attention was given to size and quantity than to quality. Judging from the records of weights of early cattle, and from drawings made at that time, cattle were ponderous, rough, slow-maturing beasts, and very patchy with great lumps of tallow. The ideals of those days were exemplified by such famous animals as the Durham Ox, weighing 3,024 pounds at five years of age, and The White Heifer That Traveled, weighing 2,300 pounds.¹ These were early Shorthorns. Among early Here-

¹ Alvin H. Sanders: *Shorthorn Cattle*, 1900, pp. 39, 42.

ford cattle, a bull, *The General*, weighed 3,640 pounds at six years. Another bull, *Wellington*, weighed 2,912 pounds, had a girth of 11 feet, 3 inches, and measured 11 feet, 4 inches, from muzzle to tail-head. Another Hereford bull, *Hamlet*, weighed 2,800 pounds, and a steer reached 2,912 pounds. At the first Smithfield Fat Stock Show held in London in 1799, a Hereford bullock described as 8 feet, 11 inches, in length, 6 feet, 7 inches, in height, and 10 feet, 4 inches,



FIG. 27.—Ideal of early beef producers. The noted “*White Heifer That Travelled*,” a Shorthorn, calved about 1806, bred and fed by Robert Colling, of Barmpton, near Darlington, in the county of Durham, England. A free-martin heifer, a non-breeder, fed to a weight of 2,300 pounds, completely finished, and publicly exhibited through the principal agricultural counties of England to advertise the beef-making qualities of the Shorthorn breed, particularly the herds of Charles and Robert Colling, first noted improvers of the breed. From an engraving made when she was seven years old. The artist has undoubtedly refined the head, horns, and bone to a considerable degree, yet the picture typifies in the size, massiveness, extreme fatness, and small bone of this animal the ideal of early beef producers.

in girth, won first prize and sold for \$500. Another ox at the same show measured 7 feet in height, and 12 feet, 4 inches, in girth.¹

Continued demand for heavy weights.—In England and America the attainment of large weights continued to be the aim of beef producers until rather recent times. Early maturity was not given much attention. It was simply a matter of making each animal as large as possible before consigning it to the butcher. Cattle were grown and fattened cheaply in those days, and the advantages of

¹ Macdonald and Sinclair: *History of Hereford Cattle*, London, 1907.

young, quick-maturing, highly-finished cattle were not so marked, nor was a good price offered for any except matured beeves. Stockmen at Albany, N. Y., offered \$1,000 to anyone who would deliver a bullock weighing 4,000 pounds. Prior to 1856, two Illinois cattlemen fed one hundred head of high-grade Shorthorn steers and marketed them at an average weight of 1,965 pounds. About the same time, another feeder collected a lot of one hundred grade steers and fed them to the enormous average of 2,377 pounds.¹ These feats are said to have widely advertised the Shorthorn as a beef-making breed, the paramount consideration of cattle feeders at that time being the attainment of great weight and immense bulk.

The turn toward baby beef.—Fat-stock shows are, in most respects, criterions of market demands in cattle. The champions of early days were big, matured steers. In 1891, the Chicago Fat Stock Show eliminated classes for three-year-old steers; that date marked the turning point toward what has since become known as "baby beef." In 1918 the International Live Stock Exposition at Chicago abolished the class for two-year-old steers and in 1926 the class for senior yearling steers was eliminated from the classification. The oldest steers which may be shown at the International are those calved on or after January 1 of the preceding year. The tendency is more and more toward the finishing of younger, quicker-maturing animals. The changes that are being wrought are not plainly evident unless comparisons are made extending over a period of years, or unless the operations of some of the more progressive beef producers have been followed during recent times.

Present demand is for early maturity.—Breeders and feeders now put much stress on quickness of maturity. This they have secured by selecting short-legged, blocky, compact animals, which fatten and mature at a much younger age than the more rangy type popular in the early days. Some sacrifice has been made of size and weight in order to produce a type that will make beef quickly, yet the better breeders are careful to maintain a proper degree of size along with the low-set, blocky type of body. The change has been beneficial to the breeder, feeder, butcher, and consumer.

Consumers' demands have changed.—The steaks and roasts of a half century ago were of large size and were frequently so fat as to be wasteful. Very fat beef is rich and juicy and may be favored if the price is not high. In early times beef was relatively cheaper than it is today, families were larger, and the average citizen did

¹ Shorthorn Cattle, pp. 335, 336.

more muscular work and more outdoor work, so that large, highly finished cuts of beef were popular. Today the price of beef is higher, families are smaller, and more people are engaged in sedentary and indoor occupations, so that cuts of beef of medium size and moderate finish best suit the needs of the average consumer. Under present conditions most consumers do not relish fat meat. Meat dealers designate very fat carcasses and cuts of beef as "wasteful." Retail dealers will not buy them except at a discount

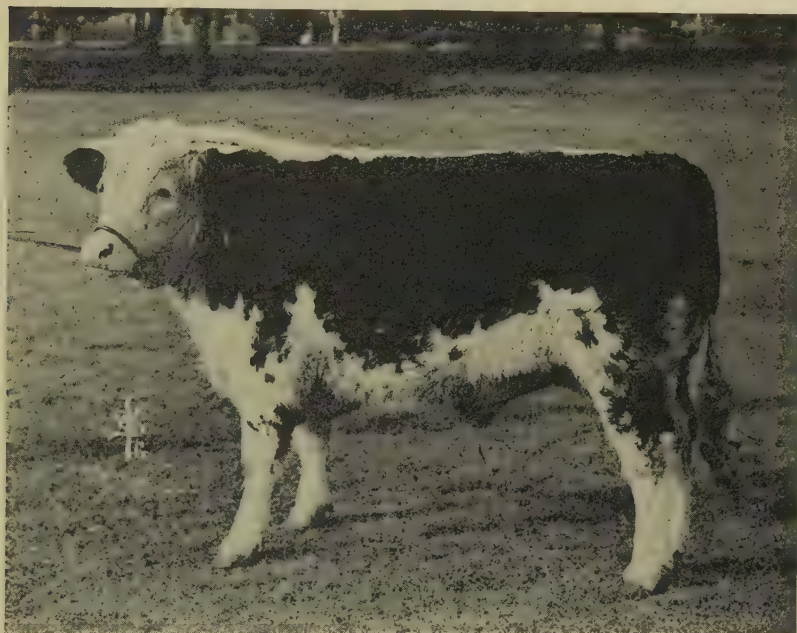


FIG. 28.—Prime baby beef. Hereford steer, Peerless Wilton 39th's Defender, grand champion at the International Live Stock Show in 1906. Bred and fed by H. J. Fluck, Goodenow, Ill. Shown by F. A. Nave, Attica, Ind.

because of the heavy trimming necessary in selling such beef to the consumer trade. Changes in demands of consumers have been a prominent factor in the swing away from old-fashioned heavy bullocks to modern baby beeves.

Baby beeves are choice and prime fat cattle, between 12 and 18 months of age, weighing 700 to 1,000 pounds. Calves and yearlings make 25 to 50 per cent more meat for the grain consumed than the same animals would make if kept until two or three years of age. The small, compact carcasses cut up with less waste, and furnish thick, light steaks such as are most in demand, because they are cheaper and of a size adapted for domestic use. Such cat-

tle will not dress out quite as high as older cattle, but the difference in percentage yield of carcass is due to a greater amount of tallow in the older animal, which materially lessens the older animal's superiority in this regard. The production of baby beef necessitates starting calves on feed at weaning time. In some instances calves intended for baby beefs are fed grain in a creep prior to weaning. Baby beef production requires that calves be fed a heavy feed of grain for 180 to 210 days or longer. As stated by the Breeder's Gazette: "It is readily observable that there is no such thing as 'warming up' or 'short feeding' calves intended for the buyers of prime baby beef. Cattle may be 16 to 18 months of age and afterward warmed up a bit, but they will not class as baby beef and they will not bring the prices of that article."

Good breeding essential.—Baby beef can only be produced from well-bred calves, as only well-bred ones mature early enough to meet the market requirements for this kind of cattle. Such calves are hard to buy and the producer of baby beef cannot feel assured of obtaining them season after season by purchase, but is practically compelled to breed them for his own use. As breeding and feeding are rather distinct lines of enterprise, and as few feeders care to maintain a breeding herd, or have facilities for doing so, baby beef production is much less followed than would be the case if good calves were readily available. Furthermore, it has been shown that only those feeders skilled in the art of finishing cattle, and fully equipped to give the animals every chance, can successfully produce baby beef.

Increased production of baby beefs.—Clay, Robinson and Company, of Chicago, in a communication to the writer, had the following to say concerning baby-beef production: "There has been marked increase in the production of this class of cattle for the reason that the public demands them. For years the tendency has been toward the maturing of cattle at a younger and younger age. It was not so many years ago when an animal was not considered ready for the market under four years old, but evolution in beef production started, and the most desirable beefs in the market today are prime, fat yearlings."

Baby beefs make economical gains.—As showing the possibilities for profit in the production of baby beefs, the Kansas Experiment Station¹ fed 130 grade Shorthorn, Hereford, and Angus calves that had just been weaned, and during seven months' feeding secured an average monthly gain of 56 pounds per head. The average

¹ Kan. Bul. 113.

weight at the beginning was 408 pounds; when sent to market seven months later, the average weight was 800 pounds, and the age was a little over one year. All except 32 head were heifers. The remarkable feature of this demonstration was the small amount of feed consumed. It required only 503 pounds of grain and 509 pounds of hay to make 100 pounds gain in weight. The best record was made by 10 skim-milk calves that were fed alfalfa hay and corn. They consumed only 439 pounds of grain and 436 pounds of hay for every 100 pounds of gain. When older cattle are fed, it usually requires about twice these amounts of grain and roughage to secure 100 pounds of gain.

E. M. Cassady and Sons, of Whiting, Iowa, made a test of the cost and rate of gains made by Hereford steers started on feed as calves and yearlings. These steers were of the same breeding, having been bred on the Cassady farm from the same sire and dams. The calves weighed 475 pounds when put on feed, and were charged at \$6.00 per cwt.; the yearlings weighed 775 pounds, and were charged at \$5.70 per cwt. Although the calves were fed for a longer period than the yearlings, the average cost of 100 pounds of gain was \$10.80 for the calves, as compared with \$15.65 for the yearlings. The calves made a profit of \$20 per head, and the yearlings made a profit of \$14.

In three years work, including three trials, the Indiana Experiment Station found that when feed prices were such that it cost \$7.74 to produce 100 pounds of gain on baby beeves, it cost \$9.09 to make the same gain on yearlings, and \$9.37 on two-year-olds.

Steer and Heifer Beef

The heading of this chapter, "Fashions in Market Cattle," implies that the demands of the cattle market are subject to change. The truth of this has been shown by the preceding discussion of the trend away from the old-time, heavy, matured beeves, and toward the finishing of younger cattle. The word, "fashions," also implies that the market indulges in some practices that are not entirely utilitarian and practical, but are more or less fanciful and whimsical. That this is true will be shown by a consideration of the cattle market's discrimination against fat heifers as compared with fat steers. When the heifer is well fed, she is consigned to a lower class than a steer of the same breeding, same fatness, same quality, same age and form. In some countries, heifers outsell steers for beef purposes. In this country there is discrimination

in price against heifers on the market, and for that reason heifers are rarely as well fed as steers.

Steers and heifers compared in tests.—In September, 1892, Wilson and Curtiss of the Iowa Experiment Station¹ purchased five steers and ten heifers and began an experiment to determine whether a discrimination against fat heifers is justifiable. All of these cattle were yearling grade Shorthorns, all sired by the same bull. Five of the heifers were spayed soon after purchase, and all fifteen head were roughed until January 4, 1893, when they were



FIG. 29.—A grand champion fat heifer, Lula Mayflower, a Shorthorn-Angus crossbred senior yearling heifer, grand champion over all fat steers and heifers at the 1921 International Show. Bred, fed, and exhibited by the University of California. Weight 1,244 pounds. Sold for \$1.10 per pound. This is the only heifer that has won this honor at the 28 International Shows held to date.

grain-fed for eleven months, and then shipped to Chicago. There they were sold on the open market to Swift and Company, who made slaughter and block tests of the animals. The results of the experiment are condensed into the following table:

¹ Iowa Bul. 24.

Steers and heifers compared in gains, yields, and profits

Weights, costs, gains, prices, yields, profits	5 Steers	5 Open heifers	1 Spayed heifers
Original weight, September 12, lbs.....	4,005.	3,455.	3,998.
Cost per lb., cents	3.5	2.	2.
Total cost	\$140.18	\$69.10	\$79.96
Cost of pasture and fodder prior to Jan'y. 4	20.00	20.00	20.00
Weight, January 4, lbs.....	4,093.	3,592.	3,994.
Av. gain on feed per animal per day, lbs.	2.44	1.99	2.07
Total gain	4,032.	3,288.	3,416.
Average cost feed per lb. gain, cents	5.02	6.04	5.86
Total cost feed	\$202.47	\$198.70	\$200.32
Shrink in shipping, lbs	215.	290.	280.
Selling weight, lbs.....	7,910.	6,590.	7,130.
Selling price per lb., cents	5.75	4.75	4.75
Selling price, total	\$454.82	\$313.02	\$338.67
Freight, yardage, and commission	24.71	24.71	24.71
Profit	67.46	.51	13.68
Beef (warm weight), lbs.....	4,997.	4,110.	4,475.
Dressing percentage	63.2	62.4	62.8
Total tallow, lbs.	969.5	648.75	701.5
10 loins, per cent of carcass	16.7	17.6	17.7
10 loins, price per lb., cents	15.	13.5	13.5
10 ribs, per cent of carcass	10.1	10.8	10.9
10 ribs, price per lb., cents	15.	13.5	13.5
10 rounds, per cent of carcass	24.1	21.5	21.7
10 rounds, price per lb., cents	6.	5.75	5.65
Margin between live cost and sales of meat and by-products, not including expense of killing and handling	\$20.45	\$58.12	\$64.84

The returns made by the heifers to Swift and Company would have justified a purchase price of \$5.37 per cwt. for the spayed heifers and \$5.32 for the open heifers, instead of \$4.75 for each, and still have left the same margin of profit as in the steers. It is clear, then, that the difference in the live-weight value of the steers and heifers was only about 40 cents per cwt., instead of \$1.00 a cwt. made by the buyers. Expert opinions secured from Chicago packers as to why the heifer carcasses sold at less price per pound than the steer carcasses were to the effect that heifers make more fat where the steers make lean meat. There is said to be more lean meat in a steer loin and a larger tenderloin. Otherwise, the carcasses were said to be of equal value.

In 1894, the Iowa Station ¹ conducted a second experiment with steers and spayed and open heifers. The same plan was followed as in the first experiment and the results were practically the same, thus verifying the results of the first test.

Why England prefers heifer beef.—It is a well-known fact that Englishmen make no discriminations against heifer beef, indeed they pay more for it than for steer beef. Wilson and Curtiss corresponded with several Englishmen concerning this matter, and the substance of the replies was that heifers yield meat of finer grain and better quality, are as good cutters, and yield little rough meat. Rib and loin cuts from spayed heifer carcasses were valued two cents per pound higher than the same cuts from steer carcasses equally well fattened. Plate cuts from heifers were valued one cent higher. Heifer beef was said to be better marbled, more pleasing in appearance, more juicy, and more palatable.

Evidently English and American standards for meats vary somewhat, and public preference has been cultivated along different lines in the two countries. So far as our American markets are concerned, it seems that the difference in prices paid for fat steers and heifers may not be justified by any real difference in the cuts of meat, yet the condition must be accepted nevertheless, and producers must shape their operations accordingly. There is, however, one logical objection to heifers; it is that they are frequently pregnant, which lowers the dressing percentage and may affect the value of the carcass. At the present time the discrimination against heifers amounts to 50 or 75 cents per cwt. for open heifers, and about 25 cents per cwt. in the case of spayed heifers. There is not as much discrimination in price against fat young heifers as against fat heifers of older age.

The question of spaying.—As the experiment discussed above dealt with spayed and open heifers, a word may be said here about the comparative merits of the two from the standpoint of the feeder. As a rule, open heifers make greater gains because of the setback caused by the operation of spaying. Once recovered from the operation, the spayed heifers gain faster, but do not reach as large weights as open heifers. The recurrence of heat in open heifers and their restlessness at that time retards the gains made, as compared with spayed heifers recovered from the operation. Spayed heifers are said to yield beef of slightly higher quality. Spaying entails a certain expense and there is danger of mortality. The general practice is not to spay when it is possible to separate

¹ Iowa Bul. 33.

the heifers and feed them in a lot by themselves. When heifers and steers are to be fed together in the same lot, spaying of the heifers is desirable, otherwise the recurrence of heat causes considerable commotion among the cattle, decreasing the gains made and increasing the cost.

CHAPTER VII

SELECTION OF FEEDER STEERS

Beef producers may be divided into two groups—(1) men who grow beef, and (2) cattle feeders. In the first group are those who maintain breeding herds for the production of steers for the market. This group includes the western cattle man on the range and also the farmer who keeps a small herd of beef cows. The beef grower has a year-round job. Furthermore, he usually follows the business steadily for a period of years. The very nature of the business demands that it be established on a permanent basis. It cannot be followed one year, given up the next year, and begun again the next, with any fair expectation of profits. The second group includes those who follow the practice of buying thin cattle to be fattened. This is simply a finishing process, and is more speculative in character than that of growing beef. It may be followed intermittently, although most successful feeders are in the business regularly each year. Furthermore, in the corn-belt states, where grain feeding is practiced, it is usually limited to a few months of the year and usually to those months when other farm work is slack.

When feeders are bought.—During the ten-year period, 1919-1928, shipments of stocker and feeder cattle from 65 public stockyards totalled 41,402,000 head, of which 45 per cent were shipped during the fall months, 19 per cent during the winter, 18 per cent during the spring, and 18 per cent during the summer.¹

Western range chief source of supply.—As shown in the preceding chapter, the corn-belt beef-grower finds baby-beef production profitable. On his high-priced land he cannot afford to raise steers to two years old or older and then fatten them. The corn-belt cattle feeder, however, is not bound by the same rules. He usually buys western steers raised on cheaper lands, and as long as thin two- and three-year-old steers may be bought at prices low enough to make them profitable, the feeder will continue to make use of them as well as of calves and yearlings.

Principal feeder markets.—The following table compiled from reports of the U. S. Bureau of Agricultural Economics gives the

¹ Compiled from U. S. Dept. Agr. Yearbook, 1928, p. 907.

location and rank of the principal stocker and feeder markets and the numbers shipped during three years:

Shipments of stocker and feeder cattle and calves from leading markets

Markets	1929	1928	1927
1. Kansas City	729,480	779,707	755,867
2. Omaha	414,481	384,193	345,625
3. Denver	344,673	391,908	331,361
4. Sioux City	295,100	284,468	250,077
5. St. Paul	284,500	297,939	315,563
6. Ft. Worth	273,333	318,388	258,958
7. Wichita	189,436	204,485	187,078
8. Chicago	165,607	164,293	168,956
9. El Paso	158,109	217,204	97,255
10. St. Joseph	108,898	116,376	107,007
Totals	2,963,617	3,158,961	2,817,747

Most of these markets lie on the margin between the western range and the corn belt. They handled 81 per cent of the total number of stockers and feeders shipped from 65 markets in 1929. The four Missouri river markets, Kansas City, St. Joseph, Omaha, and Sioux City, handled over 42 per cent of the stock and feeding cattle shipped from 65 markets in 1929. In 1928, out of a total of 3,024,000 inspected feeder cattle shipped from all public stockyards in the United States, 62 per cent were sold to 5 corn-belt states, Iowa, Nebraska, Illinois, Kansas, and Missouri.¹ Lancaster, Pa., is the leading eastern feeder cattle market.

Sorting feeder cattle.—Dealers or traders at large market centers buy carloads of mixed cattle suitable for stockers and feeders and drive them to their pens in the feeder division of the yards and sort them according to breed, color, size, and type. They are then sold to cattle feeders or to commission companies who are buying on orders.

Seasonal variations in demands and prices.—As shown in Fig. 25, page 84, the feeder movement at Chicago is at its height from September 1 to December 31, when the heavy run of western cattle comes to market. October is the month of largest feeder shipments. During 20 years at Chicago, October was the high month 15 times, September 3 times, and November 2 times. In April, May, June, and July the feeder movement is relatively small.

Monthly and yearly average prices for stocker and feeder cattle and calves at Chicago for ten years are given in the accompanying table,² the highest monthly average of each year being given in boldface type and the lowest monthly average in parenthesis.

¹ U. S. Dept. Agr. Yearbook, 1928, p. 911.

² Compiled from Drovers Journal Year Books of Figures.

*Monthly and yearly average prices for stockers and feeders at Chicago
for ten years*

Month	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	Ten-yr. ave.
Jan. ..	\$10.10	\$10.25	(\$7.30)	\$7.75	\$6.35	\$6.15	\$6.90	(\$5.90)	\$7.20	\$9.95	\$7.80
Feb. ..	9.95	11.00	7.65	7.70	6.80	6.25	7.10	6.65	6.80	9.20	7.90
Mar. ..	11.20	10.75	8.25	8.15	7.45	6.80	7.25	6.85	8.10	10.00	8.50
Apr. ..	11.90	10.95	8.70	7.85	6.95	7.00	7.10	7.35	7.40	(¹)	8.50
May ..	12.15	11.35	9.00	7.80	6.90	7.45	7.55	7.35	7.35	10.00	8.70
June ..	12.10	11.35	8.50	7.90	(6.30)	6.75	6.75	6.90	6.10	9.40	8.20
July ..	11.70	11.10	7.75	(6.75)	6.35	6.25	(5.85)	6.20	6.10	8.80	7.70
Aug. ..	10.50	11.25	8.05	(6.75)	6.65	5.95	6.10	6.65	5.90	8.30	7.60
Sept. ..	10.25	12.20	8.45	7.20	6.60	6.10	6.45	6.75	5.50	8.85	7.85
Oct. ..	10.10	10.90	9.25	6.95	7.00	6.20	6.00	6.70	5.65	8.85	7.75
Nov. ..	(9.80)	10.60	9.55	6.95	6.90	5.75	5.95	6.30	(5.45)	8.10	7.55
Dec. ..	9.80	(10.00)	9.45	6.85	7.30	(5.55)	6.00	6.30	5.75	(7.10)	(7.40)
Yr. av.	10.50	11.05 ²	8.75	7.40	6.80	6.35	6.55	6.65	6.45	8.95	7.95

¹ Practically no sales were recorded in April, 1920, due to railroad strike.

² Highest on record.

It will be noted that the time of highest and lowest prices varies greatly in different years, but that in all years, except two, highest prices were paid in the spring months, March, April, and May. Lowest prices were most often paid in December, and this fact is reflected in the column of figures at the right, giving the ten-year averages of monthly prices. This column shows that the prices of feeder cattle are usually lowest in December and highest in May. Following the December low spot there is a steady increase in price until May. Following the high prices of the spring months there is a fairly regular decline in price throughout the remainder of the year. May prices averaged \$1.30 higher than December prices during the ten years.

These facts should be taken into consideration in determining a general buying policy. It may be best to buy cattle for summer grazing in the fall, carrying them through the winter on cheap feeds. Cattle feeders in Missouri who practice grain feeding on pasture usually buy their cattle in the fall, and winter them preparatory to finishing them during the following summer.

Sources of profit in cattle feeding.—Profits in cattle feeding come from skill in feeding and management, and also from intelligent buying and selling. There is practiced what is known as "speculative cattle feeding" in which feeders emphasize the buying and selling more than they do the actual feeding of the animals, the object being to buy on a low market and sell when the market is high. Omitting this speculative feature from consideration, it may be said that the sources of profit in feeding a steer are (1) the increase in weight of the animal, and (2) the increase in

the value of the animal's initial weight.¹ For example, if we buy a thin steer at 8 cents per pound, and fatten him during four or six months feeding, we increase not only his weight, but also his value per pound. If the initial weight was 1,000 pounds, and the final weight was 1,325 pounds, he should sell at 10 cents per pound without any rise of the cattle market during the feeding period. Then the net income to the feeder would be as follows:

325 pounds at 10c.....	\$32.50
1,000 pounds at 2c.....	20.00
Net income.....	<u>\$52.50</u>



FIG. 30.—Choice and fancy selected feeder calves on feed. Grade Hereford calves in the feed-lot of E. M. Cassady and Sons, Whiting, Iowa.

The margin in cattle feeding.—The difference between the cost price and selling price per pound is spoken of as the “margin.” The steer feeder counts on a margin of at least 2 cents per pound, and when feed-stuffs are very high in price a greater margin is necessary. As shown by the above calculation, heavy cattle may be handled on narrower margins than light ones, for if the initial weight of the steer had been 600 pounds instead of 1,000 pounds, other factors remaining the same, then the net income would have

¹ For the purposes of this discussion, the value of the pork produced by hogs following cattle in the feed-lot and the value of the manure are omitted from consideration.

been less by \$8. As a matter of fact, however, the younger steer would probably make his 325 pounds of gain somewhat cheaper than the older steer, thus compensating, in part at least, the advantage of the older animal.

Selection of Feeder Steers

Success in fattening cattle requires a thorough knowledge of two classes of cattle—fat steers of the better grades, and stockers and feeders,—the beginning and the end of the feeding process. The cattle feeder must be an expert judge of a thin animal, as well as a good judge of the finished product. "Well bought is half sold." Failure to select the right kind of steers for feeding is alone sufficient to cause failure in the business. The cattle feeder must have a good knowledge of the values of the various grades of feeders, and must use judgment as to whether or not to buy, and if he buys it is again a matter of judgment as to which grade of feeders may be purchased, fed, and sold with the greatest profit. The actual buying, however, is usually put in the hands of a commission firm; such firms also freely and intelligently advise the purchaser concerning the matters here discussed.

The points which determine the value of feeder steers are age and weight, form, quality, constitution and thrift, natural fleshing, condition, breeding, disposition, style, and uniformity. Each of these is briefly discussed.

1. Age and weight.—Calves and yearlings require a longer feeding period, as a rule, than two- or three-year old steers. This is due to the fact that young animals grow while they fatten, and hence fatten more slowly than older animals. Many cattle feeders prefer two- and three-year-old steers for feeding purposes, and this is especially true when a "short feed" of from 60 to 90 days is given. For the "long feed" of 120 to 180 days or more, calves and yearlings are satisfactory if carefully selected and properly handled. Some feeders prefer the older steers even for the longer feed.

A considerable amount of experimental work has been done to determine the relative advantages in feeding calves, yearlings, and two-year-olds at the Kansas, South Dakota, Missouri, Nebraska, Iowa, Illinois, Indiana, and Ohio experiment stations. These experiments have been based entirely upon the finishing period or, in other words, have been planned from the standpoint of the cattle feeder rather than the grower.

In three different trials at the Indiana Experiment Station¹ the calves required 90 days and the yearlings 20 days longer feed-

¹ Ind. Bul. 146.

ing period than the two-year-olds to make them prime. The average daily gain of the calves was .61 pound per head less than that of the two-year-olds and .34 pound less than that of the yearlings. The following conclusions were drawn from the Indiana experiments:

1. The initial cost per cwt. of calves is greater than that of older cattle.
2. The length of time necessary for finishing steers decreases with increased age of the cattle.
3. The rate of gain and the cost of gain increases with the increased age of the cattle.
4. The proportion of roughage to concentrates consumed increases with the increased age of the cattle.
5. The amount of gain necessary in finishing cattle of equal condition decreases as their age increases.
6. The difference in total quantity of feed necessary for finishing cattle of different ages and fed to the same marketable finish is negligible.
7. The increase in live weight necessary to make calves prime was 103 per cent; yearlings, 54 per cent; and two-year-olds 43.6 per cent of their initial weights at the beginning of the feeding period.
8. The difference in cost of one hundred pounds of gain between calves and yearlings was \$1.35 in favor of the calves; between yearlings and two-year-olds, 28 cents in favor of the yearlings.

The Missouri Experiment Station¹ drew the following conclusions from feeding 300 cattle of various ages on heavy grain rations in connection with bluegrass pasture:

1. Two-year-old cattle make larger average daily gains than yearlings.
2. Two-year-old cattle consumed from 13 to 22 per cent more grain per day per head than did yearlings.
3. Two-year-old cattle consumed more grain per day per thousand pounds live weight than yearlings.
4. Yearlings require less grain for each pound of gain than do two- or three-year-old cattle. Other things being equal, the younger the animal, the less grain is required to make a pound of gain. The condition of the animal at the beginning of the feeding period is an important factor, and may to a large extent counteract the influence of age in determining cheaper gains.

¹ Mo. Bul. 90.

5. In these investigations, the fattening of two- and three-year-old cattle has been generally more profitable than fattening yearlings. The chief reasons are:

(a) The margin between the buying and selling price is less in the case of yearlings. The older cattle fatten in a shorter period.

(b) It is not generally advisable to try to finish the cheaper grades of yearlings. In our investigations, the quality of the yearlings has generally been higher than that of the older cattle. In spite of this fact, the financial results have seemed to favor the feeding of older cattle.

When all evidence as to the comparative merits of calves, yearlings, and older cattle for feeding purposes is summed up, the outstanding points are as follows:

1. Young animals, which are fattened as they grow, make cheaper gains than older animals. This is the chief advantage of the younger animal.

2. The older animals enjoy a wider margin between cost price and selling price per pound, they consume more roughage, they fatten in less time, and the cost of feed per head is practically the same as for the younger animals. These are the chief advantages of the older animal.

The numerous feeding tests conducted by the state experiment stations in which steers of various ages have been compared have produced very similar results as regards the performance of the various ages while on feed, and these results are no doubt the most valuable of any yielded by these trials. The tests have not definitely answered the question as to which age of cattle can be fed with the most profit. Some of the tests have shown the feeding of older steers to be most profitable. In other tests the calves or yearlings have returned the largest profit. These variations in financial results in different tests in different years are to be expected because of differences from time to time in the supply and price of cattle of different weights on the market and also differences from year to year in the relative prices of grain and roughage. Most of the recent trials have shown a larger profit for the calves than for the older cattle, and it is true also that the feeding of calves has become increasingly popular with feeders throughout the country. Nevertheless there is every reason to expect that the feeding of heavy steers will be most profitable in some instances and in some seasons.

The feeding of older steers is a more speculative enterprise than the feeding of calves. This is due to the fact that when the feeder of heavy steers buys his feeder cattle he buys many pounds of beef

to resell on a later market, whereas when the feeder of calves markets his baby beeves a very much larger proportion of the weight he sells is of his own making. Furthermore, the demand for heavy carcasses is limited in comparison to the demand for baby beeves, and the market for heavy finished steers fluctuates more widely, which again increases the speculative feature in the feeding of heavy steers. Part of the increased popularity of calves for feeding is due to the broad outlet and more stable market for baby beeves. Another point of practical importance is that the initial cost of calves per head is much less than that of older cattle. Two



FIG. 31.—An average load of steers on feed.

or three calves may be bought for the price of one two-year-old steer, and the feed-lot may be filled with calves at a much smaller outlay of capital.

2. **The form** should be as nearly identical as possible with the description given for the fat steer. Allowances must, of course, be made for the absence of fat in the thin animal, for we cannot expect a thin steer to appear extremely blocky and low set. Yet even in thin condition the steer should be low set, deep, broad, compact, and balanced; such conformation insures feeding capacity and early maturity. Broad, level tops make possible a maximum development of high priced cuts, and are indicative of superior form in the feeder. High-grade feeders have a straight top line and straight underline, the two being nearly parallel. For best results, a large feeding capacity is of very great importance. The muzzle should be broad, the barrel wide and deep, and the flanks well let down. An excessive paunch is undesirable, as it rarely disappears during fattening and shipping and will lessen the price paid for the finished

steer on the market. Some degree of paunchiness may be termed a good fault in a feeder, but the best feeders have much depth and fullness of middle without being objectionably paunchy. The feeder should have as much smoothness as is consistent with thinness. Too great prominence of shoulders, hips, and tail-head should be avoided. There should be nothing in his form that will prevent a high degree of smoothness being secured when he is fattened. It should be remembered that the proportions of the head and neck correspond with the type of body, and in making selections of young thin cattle these are dependable indicators of the turn the form will take during development and finishing.

The head demands far more attention in the feeder than in the finished steer. We look for what is termed the "feeder's head," that is, a head of much width between the eyes, short and clean-cut from eyes to muzzle, very broad at the muzzle, but not coarse, large of nostril, and strongly muscled and well developed in cheeks and jaws. The eye should be large, prominent, bright, clear, and placid. Polled or dehorned cattle are preferred by feeders, although this feature does not affect the grading of the animal on the market. More hornless cattle can be put in the feed-lot or car, and they make more rapid gains on feed because of less commotion and less difficulty in getting up to the feed-racks. Timid animals are much more likely to get their share of the feed if all the cattle are polled or dehorned. Hornless cattle shrink less in shipment, the carcasses show fewer bruises, and the hides are more valuable. Gashes and punctures in hides caused by goring are not uncommon. Being in greater demand, hornless cattle sell at slightly higher prices. Dehorning gives cattle a setback, causes wildness for a time, and is not advisable if cattle are to be put on feed immediately, except in the case of calves or yearlings that are to be given a long feed.¹

¹Light and Rothwell of the Canadian Department of Agriculture reported in 1922 (Pamphlet 15, New Series, Dehorn Your Commercial Cattle) that 35 steers dehorned after purchase made an average gain of 31 pounds per head during the first month, while 17 steers hornless at time of purchase made an average gain of 51.9 pounds. For the entire feeding period the average gain was 231 pounds for the hornless steers and 186.3 pounds for those dehorned after purchase. The pamphlet quotes one of the largest commission firms in the United States as follows: "The absence of horns on a bunch of steers usually adds 15 to 25 cents per cwt. to their value. All buyers prefer dehorned steers, even for local slaughter, as the carcasses are likely to be free from bruises and injuries; but the most important fact is that many eastern shippers refuse to bid on horned cattle on account of the practical certainty that some of them will be injured in transit. In the case of a bunch of steers that except for their horns would just suit the eastern shipper, the difference may amount to as much as 25 to 50 cents per cwt." A commission firm in western Canada is quoted as stating that they have handled carloads of steers and heifers so badly hooked that they sold at a discount of from \$1 to \$2 per cwt.

3. Quality.—The indications of quality in beef cattle have been discussed. Quality and good breeding are usually found in company, and good breeding surely “tells” in the feed-lot. Quality also insures smoothness and a higher dressing percentage, points of much importance in the eyes of the buyer of fat cattle. Coarse, staggy heads and necks indicate late castration. Stags sell at a discount on the fat steer market.

4. Constitution and thrift.—A wide, deep chest, full heart-girth, and deep, broad body are evidences of a strong constitution. Avoid that steer which has quality carried to the point of delicacy, as only vigorous, rugged cattle make big gains on feed. When choosing between two steers, one of which is too refined in head, hide, and bone, and the other a trifle too rugged, or what might be termed slightly on the coarse order, it will usually be wisest to select the more rugged steer; he will usually consume more feed, gain more consistently, and make his gains at less cost than will the over-refined animal.

A thrifty, healthy steer makes known the fact in a bright, clear eye, sleek coat of hair, and a loose, sappy hide. He is wide awake and gives evidence that he “feels good.” Avoid the steer with the small, dull eye; tight hide; dry, staring coat; hanging head; and lifeless gait. Red blood and good health indicate ability to assimilate feed and make gains.

5. Natural fleshing.—This refers to lean meat or muscle. As previously pointed out, feeding does not add muscle to an animal; the muscle must be born on the steer. The cattle feeder’s job is to fatten beef, and he must buy the beef or muscle when he buys his steers. Look for muscular necks, backs, loins, and rounds. Such steers bring the best prices when properly fattened.

6. Condition counts in judging feeders. The more fat a feeder steer carries, the quicker and cheaper he may be finished. Type and price being equal, fleshy feeders are more desirable than thin ones. Furthermore, if the steer is too thin he cannot class as a feeder, but instead is classed as a stocker. Stockers are thin enough to make gains in condition on grass or roughage. Feeders carry more flesh and are ready for the feed-lot.

7. Breeding.—Steers of good beef breeding are much preferred over those which have more or less of a scrub or dairy ancestry. We look for evidences of beef breeding in the form, quality, fleshing, and color of the animals. The beef-bred animal is more rectangular in build, more compact and blocky, and lower set than the dairy-bred steer. The steer of beef breeding is plumper

and thicker in his muscles throughout. The dairy-bred steer stands high off the ground, has a long, narrow head, cuts up in the flank, and is split up in the twist, "cat hammed," and rough in conformation over the hips and rump. His bone is usually too fine, and his hide too thin and "papery" in texture. Coarse, rough steers, with coarse, plain heads, show lack of good ancestry. The wide, short, clean-cut head, with broad muzzle, good eye, and marked indications of what is often termed "character," may be accepted as one of the very best evidences not only of beef breeding, but of good beef breeding. The more one deals with feeder cattle the more one learns to study heads and to place reliance on what the head indicates as to form, quality, feeding capacity, constitution, thrift, breeding, and disposition.

The colors of the beef breeds are certainly preferred in feeder steers, but many scrub animals masquerade under these colors. Red, roan, or black are frequently found in animals carrying a very small percentage of Shorthorn, Hereford, Aberdeen-Angus, or Galloway blood. Well-bred beef steers carry the colors of the beef breeds, but these colors do not always cover well-bred beef steers. Color alone is not a safe guide to good breeding. Color gives unmistakable evidence, however, if it is the fawn or spotted white and fawn of the Jersey and Guernsey, or the black and white markings of the Holstein. In such cases, color furnishes all the evidence we need as to the breeding of the animal. As to which of the beef breeds should be given preference when selecting feeders, that is almost entirely a matter of personal fancy. They are all good, and there is no best. There are differences to be sure, but none great enough to claim attention here.

8. **Disposition.**—Nervous, restless cattle are profit-losers on feed. In many instances, with proper handling, such steers quiet down a great deal as the feeding period progresses, but in many other instances this is not true. The eye and the carriage of the head, ears, and tail are indications of the disposition. A high-headed, wild-eyed steer, with ears in motion to catch the slightest sound, stampedes on the least provocation. The poll of the head should be carried only slightly higher than the line of the back, and the eyes should be placid in expression, indicating a quiet, contented feeder that will make gains in proportion to the feed he consumes, instead of wasting his energy in nervousness and frightened antics.

9. **Style.**—A low-backed, awkward, slouching kind of a steer may feed as well and yield as good a carcass as a wide-awake,

straight-lined steer that stands squarely on his legs, but other things being equal the latter steer looks much better and attracts more favorable attention on the market than the former. A steer of good style shows for all he is worth. The other kind fail to make a good impression at first sight, and on a crowded market this may mean much.

10. **Uniformity** in size, condition, color, and other points adds much to the attractiveness of a load of cattle, and in buying feeders this point is worthy of attention. They look better in the feedlot, finish for market at about the same time, and an even load of steers attracts more attention on the market than does a mixture of all sizes, colors, and sorts.



FIG. 32.—Fancy feeder calves.

Other factors.—In addition to the foregoing, other points may well be considered in selecting feeders. Avoid cattle that have cuts, sores, or lumps on them anywhere, especially those showing lumpy jaw. Avoid blind steers, lame ones, and those with crooked legs. Big, sprawling brands affect the value of the hide. When determining upon the price, remember to consider the amount of fill the cattle will carry to the scales. In buying at the large markets, avoid "stale" cattle, which means those that have been on the market several days and are too well filled. Watch the droppings for evidence of grain feeding, and give preference to grass-fed cattle as they are usually more thrifty and respond better to grain feeding. A steer that has had grain to put him in feeder condition may be looked on with suspicion. He may be a hard feeder and poor doer.

Advantages of cattle feeding.—The reasons for fattening a steer are many and important, even though feeding does not increase the proportion of lean meat or muscle. They are as follows:

1. Feeding increases the value of the steer.
 - (a) Adds weight to the animal.
 - (b) Improves the form and appearance.
 - (c) Increases the dressing percentage.
 - (d) Covers the carcass with fat so that it may be held in the cooler long enough to ripen.
 - (e) The marbling expands the lean meat, making the steer thicker in all his cuts.
 - (f) Fat makes the beef more tender and juicy.
 - (g) Fat beef cooks much better than lean beef.
 - (h) Fat meat is more nutritious than lean meat.
2. Utilizes as feed much that would otherwise be waste on the farm.
3. Gives employment to labor when other farm work is slack.
4. Makes easily possible the maintenance and improvement of soil fertility.
5. Cattle feeding, properly managed, is a profitable enterprise.

CHAPTER VIII

MARKET CLASSES AND GRADES OF CATTLE

Six well-defined classes of cattle are recognized at the large live-stock markets. Each class is divided into several grades. The six general classes and their requirements are briefly as follows:

1. **Beef steers**—including all steers suitable for block beef.
2. **Butcher stock**—including all heifers, cows, bulls, and stags suitable for block beef.
3. **Cutters and cannors**—including mostly thin cows and bulls, but also inferior steers, heifers, stags, and calves not suitable for feeding and too inferior to yield a carcass suitable for block use.
4. **Veal calves**—including all grades of veal calves.
5. **Stockers and feeders**—including thin calves, yearlings, two-year-olds, and older cattle. It includes steers, heifers, cows, and bulls.
6. **Milkers and springers**.—These are cattle of dairy breeding which are usually more valuable for milking purposes than for beef. They are sorted out and sold for dairy purposes.

The grades.—The cattle in each class are graded according to their relative value. The grades are (1) prime, or fancy selected, (2) choice, (3) good, (4) medium, and (5) common. The term "fair" means the same as "medium" and is frequently substituted for it. "Inferior" or "poor" are sometimes substituted for "common." In some classes there is no grade better than choice, and in other classes there are no grades better than good. As the term "prime" indicates a high degree of condition or finish, the best grade of feeder steers and feeder calves is termed "fancy selected."

Definitions of class and grade.—As shown above, cattle are *classed* according to the use for which they are adapted and sold. The cattle in each class are *graded* according to the degree with which they meet the requirements of the class. Briefly, then, cattle are classed according to use and graded according to value.

A market class may be defined as a group or division including all animals on the market adapted and sold for a certain commercial use.

A grade may be defined as a division of a market class including all animals of about the same value per cwt.

The principal factors determining the use and value of market cattle are form, quality, condition, weight, age, and sex.

Distinction between type and market class.—A type represents an ideal which the breeder or feeder is endeavoring to produce. Types represent only the most highly desirable or profitable sorts of animals, while there are market classes for all sorts of animals—profitable and unprofitable from the producer's standpoint. The less profitable market classes are filled incidentally, not through any design of the breeder. Some market classes are composed of animals that have already served one or more purposes; having outlived their usefulness they are discarded and sent to market. The market is accommodating; it provides a place for all sorts of odds and ends, and hunts up a use for them. Thus some market classes persist which at first thought have no excuse for being. Everything classifies somewhere.

General market terms.—Before describing the market classes and grades, some of the general descriptive terms used in the cattle market need explanation. As applied to market cattle these general terms have no direct bearing on the market classification, but they serve to indicate, in a more or less general manner, where the cattle were raised and how they were fed. Inasmuch as the cattle of many sections of the country possess certain rather well-marked characteristics, these general descriptive terms are significant and are useful in describing the character of market offerings.

Native and western cattle.—Native cattle are those originating on the farms of the Central West, East, and South. Western cattle are branded cattle from Texas and the West. Natives and westerns have practically the same uses and both are found in all market classes, except that western cattle supply no milkers and springers, and comparatively few veal calves.

Western cattle are much more uniform than natives, being largely of beef breeding, mostly Hereford. An infusion of Short-horn breeding is noticeable in many of the cattle from the Dakotas, Montana, Wyoming, Colorado, and Utah. Western cattle are frequently distinguished by the name of the state from which they come to market, as "Texans," "Montanas," "Wyomings," etc.

Natives include all types, breeds, and kinds of cattle, of beef, dairy, and nondescript breeding. The term "southerns" is applied to natives produced in the southern states, particularly to cattle from sections in the Middle South where the breeding is inferior.

As a rule, branded cattle sell at a discount because of the damage to the hide. In cases of brands on the body, the damage to the

hide is estimated anywhere from 5 to 15 cents per cwt., according to size and location, and in extreme cases where there is a big, sprawling side brand, covering a large part of the surface, the discount will be very much higher, as it practically spoils half the hide.

Grassers and fed cattle.—"Grassers" are cattle direct from pastures without grain feeding. "Corn feds" are cattle from corn-belt feed-lots. "Fed westerns" are western cattle that have been finished on a ration of corn or other concentrates, usually in the corn belt. "Grass westerns" are cattle direct from western ranges. Many grass cattle sell as stockers and feeders, and after being fattened in the feed-lot they return to market as fed cattle. Grass



FIG. 33.—Prime beef steers.

cattle are subject to greater shrinkage in shipping than are fed cattle. "Short feds" are moderately fat cattle marketed after a 60- to 90-day feeding period. Cattle coming from a very short feed are often described as "warmed up"; they show some effects of grain feeding, but are considerably lacking in finish.

Grass cattle, both westerns and natives, are most numerous on the market during September, October, and November. The closing of the pasture season and the approach of winter bring the heavy runs which feature the fall months. The movement of cattle from Texas and the Southwest usually begins in May and continues into October, and other western cattle direct from range pastures make a heavy run from August 1 to December 1.

Fed cattle are most numerous during the late winter and spring months. Thin grass cattle are taken out for feeding in the fall and early winter after the corn crop is harvested, and most of these are finished and returned to market during the winter and spring before crops need attention. From June 1 to December 1, fed cattle are less numerous on the markets.

Market Classes and Grades of Cattle and Calves

Following is the complete outline of the market classes and grades of cattle and calves:

Classes	Grades
BEEF STEERS:	
Heavy weight, 1,300 lbs. up....	Prime, choice, good, medium, common
Medium weight, 1,100-1,300 lbs..	
Light weight, 1,100 lbs. down..	
BUTCHER STOCK:	
Heifers	Prime, choice, good, medium, common
Cows	Choice, good, medium, common
Bulls	Choice, good, medium, common
Stags	Choice, good, medium, common
CUTTERS AND CANNERS:	
Bologna bulls.....	Good, medium, common
Cutters	Good, medium, common
Canners	Good, medium, common
VEAL CALVES:	
Light weight, 110 lbs. down....	Choice, good, medium, common
Handy weight, 110-190 lbs.....	
Medium weight, 190-260 lbs....	
Heavy weight, 260 lbs. up.....	
STOCKERS AND FEEDERS:	
Steers { 1,000 lbs. up }	Fancy selected, choice, good, medium, common
{ 750-1,000 lbs. }	
Calves { 750 lbs. down }	Fancy selected, choice, good, medium, common
Heifers	Choice, good, medium, common
Cows	Choice, good, medium, common
Bulls	Choice, good, medium, common
MILKERS AND SPRINGERS	

Beef Steers

The beef steer class includes both fed steers and grass steers, but the proportion of fed cattle is much higher than in any other class. Most beef steers show the effects of good feeding, and all beef steers are suitable for block-beef use.

Beef steers are the most important and highest priced class of killing cattle on the market. They sell to local packers for immediate slaughter, or to order buyers who ship them for slaughter to Boston, New York, Philadelphia, Baltimore, Cleveland, and many other cities. They dress from 55 to 67 per cent and their carcasses supply the highest class of trade, including hotels, restaurants,

clubs, and the best retail trade. The grades of beef steers are prime, choice, good, medium, and common. Form, quality, and condition are the chief factors determining the grade and price.

Three divisions may be made in the beef steer class according to weight—heavy, medium, and light. These are important because at times higher prices are paid for one weight than another. Light weights are frequently referred to as “yearlings.” Baby beeves are included here, together with all other steers weighing less than 1,100 pounds and carrying sufficient finish for block-beef purposes. At times choice and prime light-weight steers bring the



FIG. 34.—Choice beef steers.

highest prices, the prices paid for the different weights varying in relation to supply and demand.

Heavy steers, weighing 1,300 pounds and up, supply heavy carcasses weighing about 750 pounds and up. These are used by hotels, restaurants, and clubs in large cities. James Brown, in charge of cattle buying for Armour and Company, states¹ that the demand for heavy finished cattle takes only about 15 per cent of the receipts. He states that the demand for such cattle is steady and that the supply is frequently limited from August 1 to February 1, excepting cattle finished for fat-stock shows and for the Christmas trade. At such times steers weighing 1,400 pounds or

¹ *Progressive Beef Cattle Raising*, Armour and Company, 1920, p. 7.

over often bring \$1 to \$2 more than smaller steers of the same grade. Late March and April may bring too many heavy steers, and a few too many can readily glut the market, resulting in a lower price for heavy weights than for the lighter beeves.

Prime steers.—This is the most select grade of the beef steer class. Buyers for eastern markets take most of this grade, and packers take the rest. Prime steers are practically above criticism in form, quality, and fatness. They show a high development of flesh in loin, back, thighs, twist, and rump, are very broad and deep, and are free from paunchiness. The head is medium-sized and clean-cut. The bone is clean and fine, the skin pliable and medium thick, and the outlines are smooth and well rounded. The



FIG. 35.—Good beef steers.

flesh is abundant in all parts, and is firm, yet mellow and springy to the touch. There are no rolls or patches of fat, but a smooth, even, deep, firm fleshing everywhere. Very few steers come to market which grade as prime. On the Chicago market at the conclusion of the International Live Stock Exposition, which is held at the Union Stock Yards in December, most of the fat steers are sold, and these are usually prime, but it requires much searching to locate cattle of this grade at other periods of the year.

Choice steers.—If a steer is not quite right in quality or condition, but still possesses to a marked degree the characteristics most sought by packers and shippers, he is called a choice steer.

Good steers.—Good beef steers may be of very good quality,

but noticeably lacking in condition or finish; they may be finished or in prime condition, yet lacking in quality; or they may be noticeably deficient in both quality and condition, but still good enough to be above the average grade of beef steers received at the markets. By far the largest number of steers belonging to the good grade may be said to be a little on the coarse order; they are fat and of good weight, but rather plain.

Medium steers.—These are of about average quality and condition, lacking to a marked degree the finish and quality demanded in a prime steer. They are generally too paunchy and too lacking in condition and quality to dress a high percentage of beef or show



FIG. 36.—Common beef steers.

a good proportion of fat. Many grassers and warmed-up steers grade here, and also dairy-type steers carrying a fair amount of finish. The beef from such steers is not good enough to meet the demands of dealers in beef of the best quality, nor is the proportion of the high-priced cuts large. Steers of good form and quality but very deficient in condition may grade as medium beef steers, or they may sell as feeders, depending on the season and on the supply and demand.

Common steers.—This is the lowest grade of beef steers coming to the market. They are very much lacking in form, quality, and condition. This grade includes those steers which are too thin to sell among the higher grades of beef steers, and too coarse and

rough to be sold as stockers and feeders. The best that can be said of them is that they carry enough condition to escape classing as cutters. Many are of dairy type and breeding.

Heifers.—Two to four heifers mixed in with a load of beef steers may be passed without any cut in price if they are similar to the steers in all respects except sex. This is more often true of mixed loads of light-weight steers and heifers than of heavy weights. With greater weight and maturity, differences due to sex become more noticeable.

Butcher Stock

Butcher stock includes heifers, cows, bulls, and stags sold for slaughter and suitable for block-beef purposes. They dress from 50 to 61 per cent. The carcasses are largely sold to city and



FIG. 37.—Prime butcher heifer.

country retail dealers or butchers, hence the term “butcher stock” is applied to this class of market cattle. Butcher stock includes some fed cattle, but it contains a much larger proportion of grass cattle than does the beef steer class.

Heifers.—The grades of butcher heifers are prime, choice, good, medium, and common. The same conformation, quality, and condition are demanded in prime heifers that have already been noted as characteristic of prime steers. The only noteworthy difference

is that of sex. (See Fig. 29.) Choice and good heifers are very similar to steers of the same grades. The medium and common grades contain many heavier, older, and plainer heifers that are nearly matured and are very similar to cows. They show more prominence of hip, more roughness, and more unevenness of covering than do younger heifers.

The number of heifers sold at the central markets annually is less than one-third the number of steers.¹ This is because most heifers are kept on farms and ranges for breeding and are marketed



FIG. 38.—Good to choice butcher heifer.

later as cows. Inasmuch as heifers are not taken out for feeding to the same extent as steers, a larger proportion of the heifers received at markets are sold for slaughter. This explains why monthly receipts of butcher heifers are less uniform than those of beef steers. Butcher heifers are marketed in much larger numbers in the fall and early winter than at other seasons. However, the marketing of heifers is more uniformly distributed throughout the year than that of cows.

Cows.—Butcher cows are graded choice, good, medium, and common. A very few individual fat cows received at markets might be graded as prime. These are strictly fancy, well-bred cows in

¹ U. S. Dept. Agr. Yearbook, 1921, p. 289.

prime condition. Some of them are purebred cows discarded and sent to market because they are non-breeders. The supply is so limited as to be practically unimportant. The highest grade of cows sold in carload lots and regularly quoted, is choice, and there are not many of this grade. Choice cows are prime in condition and good in form, but somewhat deficient in quality. Good cows lack in both condition and quality, but are fat enough to be reasonably good



FIG. 39.—Choice butcher cow.

killers. Medium cows are poor in form, low in condition, and deficient in quality. Common cows are a still lower grade closely resembling cutters and at times sold as cutters rather than as butchers.

Cows are marketed in large numbers in fall and early winter, and at that time cow slaughter frequently exceeds steer slaughter. The slaughter of cows is much less uniform in numbers than that of steers. This is because most cows go to slaughter direct from grass in the fall, while many grass steers are carried over for winter feeding. The absence of a cow carry-over is felt in the spring and early summer when receipts of cows are light and prices are the highest of the year. Usually the number of cows slaughtered in May is about one-third the number of steers slaughtered in that month.

Bulls.—The grades of butcher bulls are choice, good, medium, and common. There are very few choice bulls; the supply of these consists of beef bulls which have become too aged for further use as breeders. Bulls of the good grade lack in quality and condition.

Medium bulls are deficient in form, quality, and condition, being decidedly on the plain order. Common bulls are thin, long legged, and coarse. They are very similar to bologna bulls and at times are used for the same purposes.

Stags.—Very few stags are received. They are graded the same as bulls, but command a somewhat better price depending on how closely they resemble steers in form and quality.



FIG. 40.—Good cutters.

Cutters and Cannery

This class includes all cattle sold for slaughter which are so deficient in condition that most of the carcass or all of the carcass will not be suitable for block use. It includes cows, heifers, bulls, stags, calves, and steers, but the most numerous are old cows, very paunchy and very thin. Many of them are aged dairy cows which have outlived their usefulness as milk producers. Cutters and cannery dress from 35 to 55 per cent.

Bologna bulls.—These are bulls that are muscular but not fat enough for block-beef purposes. They are especially suitable for the manufacture of bologna sausage. Big, beefy Holstein bulls are said to be best adapted to the bologna trade. The loins and ribs of many bologna bulls are sold for block use and the remainder of the carcass is used for bologna and dried beef. Dried beef is made almost entirely from the rounds, which are cured in sweet pickle, dried, and smoked. The grades of bologna bulls are good, medium, and common. The good grade closely approaches the common grade

of butcher bulls, and the common grade merges with the best grade of canner bulls.

Cutters.—These are cattle inferior as killers, but which cannot be used to better advantage in any other way. Most of them are old cows, but some heifers and steers are included also. The loins and ribs may be sold for block use, but all other parts of the carcass are used for barrelled or corned beef, canned beef, and dried beef. Barrelled or corned beef is cured and packed in brine. Canned beef is given a mild cure, partially cooked, and sealed in tin or glass jars.¹ The carcasses of cutters are often described as “shelly,” meaning that they are decidedly lacking in thickness. They are practically devoid of fat. Bologna bulls are similar to cutters in



FIG. 41.—Medium canner cow.

condition and in their use, but are more muscular, are classed separately, and sell at somewhat better prices. The grades of cutters are good, medium, and common.

Canners.—This class includes cows, heifers, bulls, stags, steers, and calves of a very low, inferior order, too lacking in flesh to permit of even a part of the carcass being sold over the block. They are also too old and unthrifty or of such inferior type and breeding as to render them unfit for the stocker and feeder trade. They are the very lowest grade of cattle coming to market. Old, thin dairy cows are most numerous in this class, and market men refer to them as “Dairy Maids,” “Nellies,” “Hat Racks,” “Shells,” “Skins,” “Dogs,” and “Sea Horses,” thus indicating their lack of apprecia-

¹ Ill. Bul. 147, pp. 208-210.

tion for such cattle. The grades of canners are good, medium, and common. Louis D. Hall states¹ that typical canner carcasses have no covering of fat, no kidney fat, and in most cases only sufficient flesh to hold the bones together. The flesh is generally very dark in color. About one-third of the carcass is used for canning and sausage purposes and the remainder is "stripped" and sold as boneless fresh beef cuts and barrelled beef, mostly the latter.

Veal Calves

Veal calves are largely a by-product of the dairy industry. Most of them are of dairy type and breeding, and are not profitable to raise for beef. The desired type is a blocky, smooth calf, with com-



FIG. 42.—Choice veal calf.

paratively small head and fine bone. The neck and brisket should be full, ribs well covered, back and loin wide, flanks full, rump plump and meaty, thighs plump, and scrotum or udder full. The skin should be mellow and pliable, the coat of hair thick, long, and soft, and the tail bushy. L. D. Hall states² that short, straight hair lying close to the skin and a "whiplash" tail are usually characteristic of poorly finished calves, and that properly finished native calves 4 to 6 weeks old produce the best veal, though some choice calves are older. He also states that the dew claws harden at 2 or 3 weeks of age, that calves under 3 weeks old are subject to condemnation, and that few carcasses weighing less than 50 pounds are

¹ Ill. Bul. 147, pp. 178, 179.

² Ibid, p. 212.

passed by government meat inspectors. Calves under 3 weeks old are termed "deacons" or "bob veal." A strictly fat calf of 150 pounds is the sort that tops the market. Calves are dressed with the skin on, and a well-fattened calf dresses from 65 to 70 per cent. The best veal is produced by milk feeding and good management. Calves which have had little milk, much exercise and exposure, and a long shipment to market bring a low price.

Veal calves range in weight from 80 to 450 pounds and in age from 3 to 20 weeks or over. They are divided by weight into light weights, handy weights, medium weights, and heavy weights. Light-weight calves under 110 pounds are most numerous in April and May, and as the season progresses the calves received at the markets gradually become heavier. Handy weights, ranging from 110 to 190 pounds, are preferred, the best carrying high finish and weighing from 140 to 160 pounds. Medium weights from 190 to 260 pounds are preferred to light weights. Heavy weights over 260 pounds bring the lowest prices.

The grades of veal calves are choice, good, medium, and common, chiefly according to condition, weight, and age. Following are the general requirements of the various grades:

Grade	Condition	Weight	Age
Choice	well fattened	120-160 lbs.....	4- 8 weeks
Good	fat	110-200 lbs.....	4-10 weeks
Medium	medium fat	100-240 lbs.....	3-12 weeks
Common	thin	80-450 lbs.....	wide range

As shown above, the choice grade includes only handy-weight calves in high condition. The good grade includes handy weights and the best and lightest medium weights. The medium grade includes all except heavy weights. The common grade includes all weights. Lack of either high condition or desired weight consigns the calf to the lower grades.

The largest run of veal calves occurs in the late spring, reaching its peak in May. The veal calves annually slaughtered in the United States are about one-half as many as the cattle slaughtered for beef, but their total dressed weight is only about one-tenth of the dressed weight of cattle. A much larger percentage of veal calves than of cattle is slaughtered on farms and in small establishments not under federal inspection.

Stockers and Feeders

Stockers and feeders include calves, yearlings, two-year-olds, and older cattle. This class includes steers, heifers, cows, and bulls. There is no sharp line of distinction between stockers and feeders;

the same kind of cattle may sell on the same day for both stock and feeding purposes. In a general way, however, the difference between a stocker and a feeder is that the stocker is usually a younger, lighter, thinner, and lower priced animal, commonly used for wintering on roughage, or for spring, summer, and fall grazing, with little or no grain. After stockers have acquired more condition and weight in this manner, they may be returned to market as grass cattle or they may be kept and fattened on a grain ration before



FIG. 43.—Choice feeder steer.

returning them. In the latter case they first become feeders and finally fat cattle before they are again sold.

A feeder is usually a steer, older, heavier, and carrying more flesh than the stocker, and is suitable for placing in the feed-lot immediately for fattening on a grain ration. However, a large number of calves sell as feeders, including mixed lots of steer and heifer calves. These constitute the only important exception to the above general statements. Stocker and feeder calves commonly weigh from 350 to 450 pounds. Popular weights for stocker cattle range from 450 to 700 pounds, and the most popular range in weight of feeder steers is 750 to 1,000 pounds. Feeders of these weights are usually long yearlings or two-year-olds. At times fleshy feeders weighing 1,100 to 1,200 pounds are in strong demand for a short feed.

Feeder steers.—On the market the term “stocker” or “feeder”

used without a qualifying word is always understood to mean a steer. The grades of feeder steers are fancy selected, choice, good, medium, and common.

Fancy selected feeders.—Very few of the fancy grade reach the market, as breeders fortunate enough to own thin steers of such quality usually hold them until finished as prime steers, or sell them direct to cattle feeders at good strong prices. Fancy selected feeders must be uniform in size, type, and color, and show unmistakable signs of good breeding. (See Fig. 30, page 113.) They are prac-



FIG. 44.—Good feeder steer.

tically above criticism, possessing in a high degree the form, quality, constitution, and fleshing of an ideal feeder as described in Chapter VII.

Choice feeders.—Steers of this grade will, under proper management, develop into choice and prime beef steers. They possess the ability to make economical gains in flesh. Choice feeders compared to fancy selected feeders are somewhat deficient in some one point, such as form, quality, or uniformity, or they are slightly deficient in several points. They must show evidence of good breeding, and everything considered they are excellent cattle for feeding purposes. Most of the best feeder steers on the market grade as "choice" rather than as "fancy selected."

Good feeders.—These possess in less degree the qualities which characterize choice and fancy selected feeders. They are not so thrifty, have not as good conformations, and carry a smaller percentage of good breeding. They are easily criticized, for they are

too long of leg, too narrow across the back, and either too fine or too heavy in bone. Good feeders will finish into good beef steers, or perhaps may make the choice grade.

Medium feeders.—These are very much lacking in form, quality, and constitution, and very seldom grade higher than medium when fattened. Many of them are off-colored and spotted, indicating dairy or inferior breeding.

Common feeders.—These are common in quality, conformation, and condition. Dairy-type steers classify here.



FIG. 45.—Medium feeder steer.

Yearling stockers.—Many thin, light-weight yearling steers are available as stockers and are quoted in market reports as “yearling stockers.” They are such cattle as will, after a summer on grass, or a good wintering, be suitable for grain feeding. The grades are fancy selected, choice, good, medium, and common. These grades are very similar to the grades of feeders which have been described.

Stocker and feeder calves.—During the fall months many western calves, both steers and heifers, are sold at weaning time for stocking and feeding purposes. With increased attention to baby beef production, the well-bred feeder calf has become popular. Uniformity and good breeding are especially important in calves intended for the feed-lot. Lack of uniformity among young animals becomes magnified as they develop, and baby beef production demands good breeding as a guarantee of early maturity, or finish at a young age. Most calves started on feed in the fall and early

winter are finished for the June market following the spring run of heavy beef steers. Some are continued on feed through the summer and marketed in September.

The grades of stocker and feeder calves are fancy selected, choice, good, medium, and common. Only the better grades are commonly sold as feeders, the lower grades being used as stockers. Steer calves are preferred for feeding. The grade depends on the form, quality, constitution, breeding, and uniformity, corresponding to like grades of feeder steers. Many choice and fancy western calves are now sold direct from the range to corn-belt feeders. Auction sales at western points and in the corn belt, and sales on mail order and at private treaty on the range now take a large num-



FIG. 46.—Common feeder steer.

ber of the best calves, such as the S. M. S. brand and Highland Hereford Association, both of Texas, and others of similar quality.

Stock heifers.—Yearling and older heifers are taken out for stocking and for breeding purposes. Those taken from the markets for use in breeding herds must pass the tuberculin test. Some are sold for grain feeding. The grades are choice, good, medium, and common. These are similar to the corresponding grades of feeder steers.

Stock cows.—The foregoing remarks relative to stock heifers apply also to stock cows, except that cows are seldom taken out for grain feeding. The grades are choice, good, medium, and common.

Feeder bulls.—These are young bulls of beef type. They are usually stagged (castrated) and are frequently mixed in with loads

of steers when fat. Many of them pass as steers when returned to market; others plainly show coarseness of head, neck, and fore-quarters due to late castration and are sold as stags. The supply and demand are limited. The grades of feeder bulls are choice, good, medium, and common.

Milkers and Springers

These are cows and heifers of dairy type and breeding which are sorted out of the run of cattle at the market and sold to dairy-men. They are sold by the head, whereas all other classes of cattle are sold by the hundredweight. The only difference between a milker



FIG. 47.—Stockers.

and a springer is that the former is in milk while the latter is heavy in calf and will freshen soon. The springer gives evidence in her type, color, and mammary development that she will be a useful milk cow after calving. The value of this class of cattle depends partly on their age, and this is determined from the teeth.

How are cattle classed and graded?—Persons who are not familiar with the large markets sometimes ask by what method the thousands of cattle arriving daily at the yards are divided into the various classes and grades. To reply that cattle are classified according to the use made of them, while true, is not a satisfactory answer, for another question then arises as to who or what decides how they shall be used. It may be said that the class and grade of

any particular animal or carload of animals on the market will be finally determined by the competition on that day's market and by the price paid; in other words, supply and demand largely determine the limits of each class. For example, certain steers received at the market are of a type and carry a degree of fleshing which place them at about the dividing line between stockers and feeders on the one hand and beef steers on the other. The class these steers will make will depend on who will bid the highest for them. If there is a big run of feeders that day and not many beef steers, the fat cattle buyers will probably bid higher for them than anyone else, and so they go as beef steers. If the fat steer market is dull and the feeder market active, they will in all probability be sold as feeders.

There is the same indefinite line of division between the poorest grade of butcher cows and the best grade of cutters. The former shade off by degrees into the latter. Cows may sell one day as butcher cows that would sell the next day as cutters, depending on fluctuations in supply and demand. It is again impossible to fix absolutely the line of division between cutters and canners. One merges with the other. Likewise stockers and feeders cannot be sharply separated. Butcher bulls and bologna bulls furnish still another example. It is possible that an animal might be almost equally eligible to three classes. For instance, a heifer of a certain type and degree of flesh might at some seasons of the year, class among the poorest butcher heifers, the best cutters, or as a stock heifer, with the chances of each about even on an average market. Such a case is not decided until the animal is sold. If a buyer of butcher stuff bids the most, she will be used that way. If the cutter buyer for the packer gets her, she is a cutter. If she is bought by a commission firm for a farmer, she is a stock heifer. She will sell to the highest bidder on that day's market. Thus we see that there is considerable overlapping of classes, and that some cattle cannot be definitely classified until they enter into competition on the market and are sold.

The market classes and grades of live stock are not official or standardized as are the classes and grades of grain. Grain is commonly bought on grade without inspection by the buyer, but the grading of live stock has not been perfected to this extent. Live stock is bought and sold at the markets in the presence of the buyer and seller, or their agents. So many factors determine the value of an animal and these factors vary so widely that an exact, standardized classing and grading of live stock does not seem possible. Nevertheless, the classifications of live stock which have grown up

with the markets serve a useful purpose. They enable buyer, seller, and market reporter to describe particular lots of animals in few words and with considerable accuracy. They are valuable in quoting prices and in reporting the market. Furthermore, a knowledge of the classes and grades enables the live-stock producer to interpret market reports and to gain a fairly accurate knowledge of market values and their fluctuations from day to day.

Lack of uniformity in classing and grading.—The men engaged in buying and selling on any market differ somewhat in their opinions as to the exact requirements of the various classes, and they differ to a considerable degree concerning the requirements of the various grades in each class. They usually agree very closely on the price, yet one prominent buyer may call a certain fat steer a typical “choice” steer, and another equally well-qualified buyer may call him a typical “good” steer. This difference of opinion is largely explained by the fact that they are accustomed to express values in terms of dollars and cents rather than in the grade names used in reporting the markets in the newspapers. There is no close agreement on the exact application of these terms. Even the reporters for the papers are not themselves agreed on the application of many terms they use.

Between one market and another there are still other differences in the application of terms. The best beef steers of a certain market will be quoted as prime steers in the daily reports of that market as given in the newspapers, yet these same steers on some other large market where a better class of cattle is regularly received would never be called better than choice steers. Admittedly there is opportunity for, and need of, greater uniformity in the use and meaning of market terms, yet the market classifications as they now exist at various markets, with all their inaccuracies and lack of uniformity, serve a valuable purpose. They furnish at least some sort of a “handle” to the market. Without them it would be next to impossible to report the markets to country stock buyers, stockmen, and farmers.

Cattle Prices at Chicago

Chicago prices during 1929.—As indicating the comparative market values of the various market classes, the following prices from the Chicago market covering the year 1929 may be noted:¹

¹Compiled from Drovers Journal Year Book of Figures for 1929.

Class	Range in price	Average price
Beef steers.....	\$8.75-\$17.00	\$13.40
Butcher cows and heifers.....	5.85- 16.00	9.70
Bulls, all classes.....	6.00- 12.50	8.95
Bologna bulls.....	7.00- 10.50	9.00
Cutter and canner cows.....	4.25- 8.35	6.25
Veal calves.....	6.00- 20.00	14.40
Stockers and feeders.....	7.00- 13.85	10.50
Grass western steers, all classes.....	8.00- 13.75	10.15
Grass western cows and heifers, all classes.....	5.25- 12.00	.....

Market values of the various classes.—In determining the comparative market values of the various market classes, averages for one year are not sufficient as a basis for comparison. The following table¹ gives the yearly average prices at Chicago for the several market classes from 1920 to 1929, and also the averages for the entire ten-year period:

Average prices for cattle and calves at Chicago for ten years

Year	Beef Steers						Western range steers	Butcher cows and heifers	Bologna bulls	Cutter and canner cows	Veal calves	Stockers and feeders
	750-1050 lbs.	1050-1200 lbs.	1200-1350 lbs.	1350-1500 lbs.	1500-1800 lbs.	750-1800 lbs.						
1920	\$11.55	\$12.50	\$13.85	\$14.80	\$15.80	\$13.30	\$8.80	\$8.55	.....	\$5.05	\$14.90	\$8.95
1921	7.20	7.65	8.20	8.60	8.90	8.20	6.15	5.40	.....	2.90	9.80	6.45
1922	8.00	8.40	9.00	9.50	10.00	9.00	6.60	5.70	.....	3.15	9.70	6.65
1923	8.95	9.35	9.70	10.25	10.50	9.55	6.65	5.95	4.65	3.10	10.10	6.55
1924	9.00	9.40	9.60	10.05	10.35	9.60	6.50	5.70	4.45	3.00	10.00	6.35
1925	9.70	10.00	10.00	11.30	12.00	10.55	8.35	6.30	4.80	3.35	11.05	6.80
1926	9.65	9.70	9.65	9.80	9.95	9.70	7.35	6.75	6.00	4.20	11.95	7.40
1927	11.10	11.50	12.25	13.15	13.90	11.70	10.70	7.90	6.85	5.05	12.45	8.75
1928	13.55	13.85	14.25	14.90	15.40	14.05	11.65	9.75	8.75	6.40	13.80	11.05
1929	12.80	13.05	13.40	13.95	14.30	13.40	10.15	9.70	9.00	6.25	14.40	10.50
10- year ave.	10.15	10.55	11.00	11.65	12.10	10.90	8.30	7.15	.....	4.25	11.80	7.95

From the standpoint of averages, it will be observed that the price of a beef steer bears a constant relation to his weight, the heavier the steer, the higher the price per cwt. This is due to the fact that as a steer becomes older he fattens more easily; and in dealing with groups of very large numbers of beef steers of different weights, all factors determining value are equalized except the factor of fatness. Between the average prices of 900-pound and 1,125-pound beef steers there is a difference of 40 cents per cwt.; between 1,125-pound and 1,275-pound steers the difference is 45 cents; between 1,275 and 1,425 pounds it is 65 cents; and between 1,425 and 1,600 pounds it is 45 cents. The sum of all these differences is \$1.95, which is the difference between the average prices of the

¹ Compiled from Drovers Journal Year Book of Figures for 1929.

lightest and heaviest groups of beef steers. All beef steers together sell \$3.75 higher than butcher cows and heifers. Between stockers and feeders and beef steers there exists a margin of \$2.95 based on the Chicago figures. Butcher stock sells \$2.90 higher than cutters and canners. Veal calves bring the highest price of any class, exceeding the price of beef steers by 90 cents.

Highest and lowest monthly prices.—It is true of Chicago and of the other large markets that beef steers are usually highest in

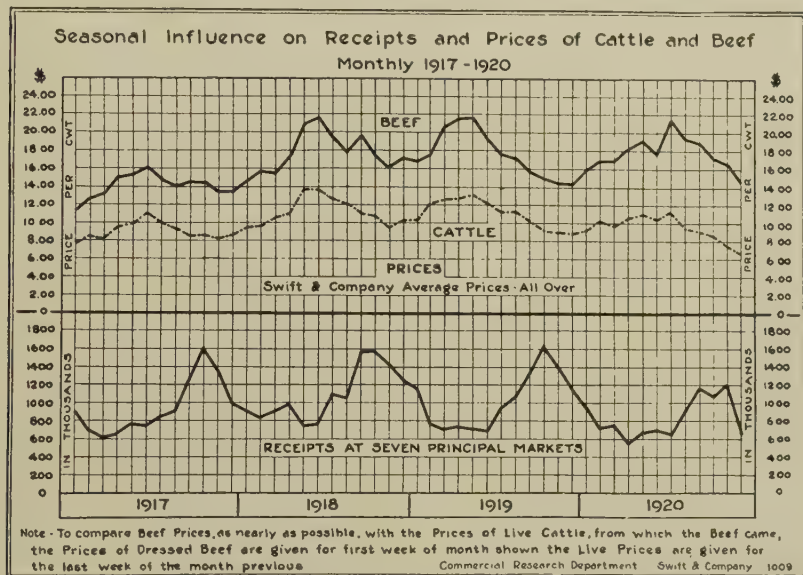


FIG. 48.—Effect of the supply of cattle upon live prices and beef prices, as shown by receipts at seven leading markets, prices paid for cattle by Swift and Company on its entire cattle purchases in the United States, and prices received by Swift and Company for dressed beef. Note that prices for both cattle and beef are highest in seasons of lightest receipts, and lowest when there is the largest supply.

price in late August or early September. They are usually lowest about the last of January or first of February.

Highest prices for stockers and feeders are made in May, which marks the opening of the pasture season. Lowest prices occur in November and December, December being the lowest.

Butcher cows and heifers sell highest in May, and lowest in November and December.

Cutter and canner prices exhibit no marked high and low spots, and the high points in prices are the most irregular in occurrence of any class of cattle.

Largest receipts of veal calves arrive in April and May. Highest

prices are made in September and lowest prices in April. One reason for the low price in April is that a large majority of spring calves are too small to yield high-class veal. Fewest light-weight calves are received in September and October.

Two kinds of fluctuations are evident in live-stock prices. One may be termed the "general trend." This affects prices over a considerable period of time and is usually associated with changes in prices of other commodities. The other consists of daily, weekly, monthly, and seasonal fluctuations, due largely to variations in supply and not associated with changes in prices of other commodities. These two classes of fluctuations are both well illustrated in the following table¹ giving the monthly and yearly average prices of beef steers at Chicago for ten years. The general trend of prices is shown by the yearly averages at the bottom of the table. The monthly or seasonal fluctuations are shown by the ten-year averages of monthly prices in the last column at the right:

Monthly and yearly average prices for beef steers at Chicago for ten years

	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	Ten-yr. ave.
Jan.	\$12.55	\$13.90	(\$10.20)	\$9.65	(\$9.10)	\$9.45	\$9.15	(\$7.05)	\$8.70	\$13.95	\$10.35
Feb.	(11.90)	13.25	10.50	9.65	9.35	9.30	(8.85)	7.45	8.20	13.05	(10.15)
Mar.	12.70	12.85	10.65	9.60	10.25	9.55	(8.85)	8.00	9.05	13.10	10.45
Apr.	13.50	13.10	10.95	9.40	10.20	9.95	9.00	7.95	8.15	12.30	10.45
May	13.65	13.15	10.95	(9.25)	10.05	9.65	9.50	8.30	8.25	12.25	10.50
June	14.20	13.90	11.20	9.65	10.75	9.35	10.00	8.95	8.00	14.95	11.10
July	14.85	15.00	11.75	9.40	12.05	9.45	9.65	9.50	8.10	15.00	11.50
Aug.	14.50	15.25	11.80	9.50	12.10	9.60	10.65	9.65	8.50	14.85	11.65
Sep.	13.60	16.00	12.70	10.50	11.70	9.70	10.20	10.20	8.00	15.05	11.75
Oct.	13.40	14.55	13.50	10.20	11.20	10.30	10.15	10.65	8.10	14.20	11.60
Nov.	12.60	13.70	14.00	9.85	10.15	9.75	9.70	9.85	7.40	12.00	10.90
Dec.	12.60	(12.80)	13.25	10.25	9.75	(9.20)	9.50	9.20	(7.00)	(10.10)	10.35
Yr. av.	13.40	14.05	11.70	9.70	10.55	9.60	9.55	9.00	8.20	13.30	10.90

The table shows that yearly average prices for beef steers declined to the amount of \$5.10 from 1920 to 1921. The decline from 1919 to 1921 amounted to \$7.30. This was due to the severe depression or reaction in prices immediately following the World War. Prices of beef cattle remained at comparatively low levels for over six years. Prices increased considerably in the fall of 1927 and continued strong during 1928 and 1929.

Highest monthly prices are printed in bold-face type. These occur most frequently in August, September, and October. The last column at the right shows that these three months average highest for the ten years, with September highest of all.

Lowest monthly prices are enclosed in parenthesis. In all but

¹ Compiled from Drovers Journal Year Books of Figures.

two years these occurred in December, January, and February, and the column at the right shows that these three months average lowest, with February lowest of all. There is a steady rise in price from February to September, followed by a rapid decline from September to December. Between February and September the difference in price is \$1.60.

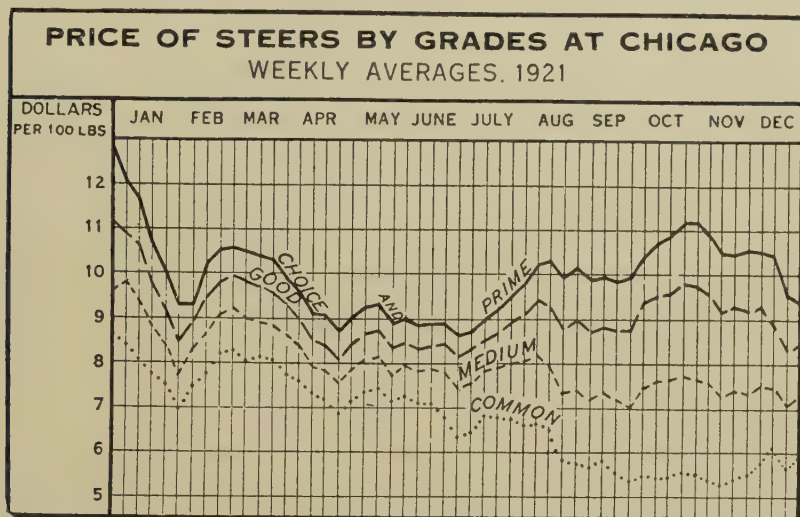


FIG. 49.—Spread in price of beef steers.

The spread in price of beef steers.—As a general rule, the price of any particular class or grade of cattle is highest when the supply is lowest, and *vice versa*. In the spring a large number of good, choice, and prime steers are received from corn-belt feed-lots, and the movement of grass-fattened steers is at low ebb. This tends to lower the price of the better grades of beef steers and to increase the price of the medium and common grades, so that there is relatively little spread (difference) in the price of all beef steers during spring months.¹ In the fall, conditions are reversed and the spread in price is very much greater. In 1921 choice and prime steers sold higher in fall than in spring, while medium and common steers sold considerably lower in fall than in spring. The weekly price averages showed a spring spread of a little less than \$2, and a fall spread of about \$6, or three times as much. The general trend of the market during that year was downward. These facts are illustrated in Fig. 49.

¹ Sheets, Baker, Gibbons, Stine, and Wilcox: Our Beef Supply, U. S. Dept. Agr. Yearbook, 1921, p. 305.

CHAPTER IX

BREEDING FOR THE MARKET

The following figures reported by the U. S. Department of Agriculture show the rank of the leading cattle countries and the total number of cattle (beef and dairy cattle) in each:

Number of cattle in leading countries

Country	Year	Total cattle
1. British India	1928	151,156,000
2. Russia	1929	66,693,000
3. United States	1930	57,967,000
4. India, Native States	1927	34,544,000
5. Argentina	1929	34,410,000
6. Brazil	1920	34,271,000
7. China	1913	21,997,000
8. Germany	1929	18,390,000
9. France	1929	15,005,000
10. Great Britain	1929	12,017,000
11. Australia	1928	11,617,000
12. Union of South Africa	1928	10,655,000
13. Uruguay	1929	9,153,000
14. Canada	1929	8,931,000
15. Siam	1928	8,657,000
16. Poland	1927	8,602,000
World total		642,300,000 ¹

¹ U. S. Dept. Agr. Yearbook, 1930, p. 827.

The United States has about 9 per cent of the world's cattle. The 1920 census reported 35 million beef cattle and 32 million dairy cattle in the United States. On January 1, 1929, the number of milk cows on farms in the United States, as estimated by the U. S. Department of Agriculture, was 21,820,000 and the remaining 33,931,000 were reported as "other cattle." The average value of milk cows was estimated to be \$84.59 and of "other cattle," \$43.12. Cattle other than milk cows are principally beef cattle.

Cattle and population.—The population of the United States has shown a steady and regular increase since 1850, and the increase in number of cattle kept pace with it until about 1895. Since that time the number of both beef and dairy cattle has remained fairly constant, while population has continued to increase steadily. Therefore the number of cattle to each inhabitant has declined somewhat since 1895. However, the use of better animals for breeding purposes has improved the usefulness of all of our farm animals; hence decline in number of cattle per capita has been partially met by improvement in quality.

The accompanying table ¹ shows the annual slaughter and consumption of beef and veal. The annual slaughter is representative of annual production. Failure of our beef production to keep pace with our growing population is reflected in the annual per capita consumption of beef which declined from 71.1 pounds in 1910 to 51.4 pounds in 1929.

*Estimated annual production and consumption of dressed beef and veal
in the United States*

Calendar year	Total slaughter		Gain or loss through exports and imports		Consumption			
					Total		Per capita	
	Beef	Veal	Beef	Veal	Beef ¹	Veal ¹	Beef	Veal
	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Pounds	Pounds
1900.....	5,694	265	—438	.....	5,165	265	67.8	3.5
1910.....	6,703	632	—111	.....	6,561	632	71.1	6.8
1920.....	6,713	797	—112	+8	6,715	805	63.1	7.6
1925.....	7,146	1,001	—22	+3	7,175	1,004	62.2	8.7
1926.....	7,458	960	+3	+4	7,454	964	63.6	8.2
1927.....	6,826	867	+48	+8	6,926	874	58.4	7.4
1928.....	6,082	814	+97	+8	6,210	822	51.7	6.8
1929.....	6,065	816	+111	+5	6,247	821	51.4	6.8

¹ Includes differences between quantities in storage at beginning and end of year.

The distribution of beef cattle in the United States is shown by the numbers of cattle other than milk cows in the leading states and the numbers of such cattle in the various geographical divisions:²

Leading states in numbers of "other cattle" on farms, January 1, 1929

State	Number	State	Number
1. Texas	4,652,000	8. Oklahoma	1,113,000
2. Iowa	2,531,000	9. Colorado	1,073,000
3. Nebraska	2,153,000	10. South Dakota	1,047,000
4. Kansas	2,130,000	11. Illinois	1,018,000
5. California	1,329,000	12. New Mexico	1,015,000
6. Missouri	1,299,000	13. Wisconsin	927,000
7. Minnesota	1,254,000	14. Montana	926,000

Distribution of "other cattle" on farms by geographical divisions, Jan. 1, 1929

Division	Number
North Atlantic.....	1,479,000
South Atlantic.....	1,991,000
North Central, East of Mississippi River.....	3,856,000
North Central, West of Mississippi River.....	11,038,000
South Central.....	8,317,000
Far Western.....	7,250,000

Total United States.....33,931,000

¹ U. S. Bur. Agr. Econs., Mimeographed Rpt., Statistics of Meat Production, Consumption, and Foreign Trade of the United States, 1900-1929.

² Estimates of the U. S. Department of Agriculture.

Beef cattle breeding in the United States centers largely in two regions: (1) the western portion of the corn belt, and (2) the great plains region of Texas, New Mexico, and Colorado. The census of 1920 showed that Texas had more than two and one-half times as many beef cows and heifers of breeding age as her nearest competitor, Iowa. Texas had over 17 per cent of all the beef cows and heifers of breeding age in the United States. Texas and the Southwest annually send large numbers of calves and young cattle to the corn belt and to the northern range states for stocking and feeding purposes. The movement of cattle from the Southwest is northerly and easterly. Other western states contribute to the annual crop,

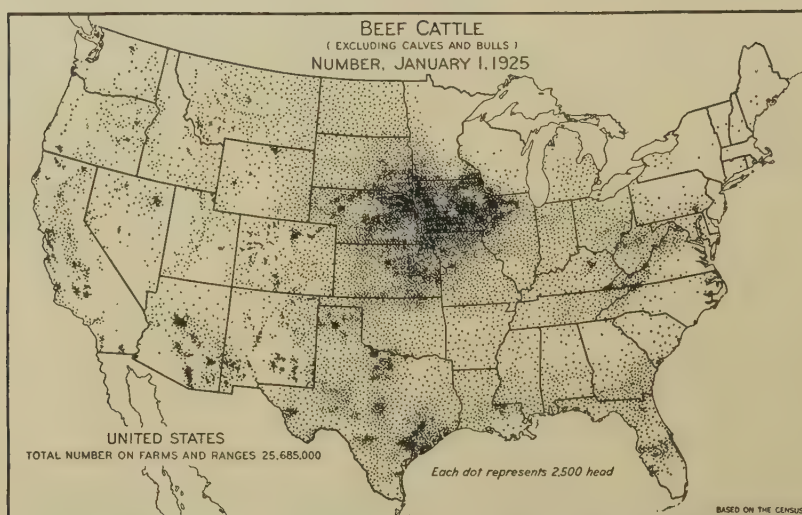


FIG. 50.—Distribution of beef cattle in the United States. Each dot represents 2,500 head.

and the central states produce many of their own beef cattle, but the Southwest is the great supply source of calves and young stock to be grown and finished in other regions. As stated by James E. Poole, market editor of the *Breeder's Gazette*, "Texas and other sections of the great southwestern breeding ground have replenished northern pastures year after year from a seemingly inexhaustible supply. Owing to its climatic and physical character, it is probable that for all time to come this western breeding ground will continue to replenish the feed-lots and pastures of the Mississippi and Missouri basins." Texas and the southern range are best adapted to economical calf production, the northern range to maturing and grass fattening, and the corn belt to grain finishing.

The accompanying table¹ presents some interesting figures based on the 1920 census covering the 14 states which had the most beef cows and heifers of breeding age on January 1, 1920. Seven of these states are western and seven are central. Note the right-hand column of figures giving the ratio between beef calves and beef cows in these states on January 1. Note especially the marked difference between the ratios for Texas and Iowa, the two leading states in beef cattle breeding.

Number of beef calves compared to number of beef cows and heifers, January 1, 1920 (Census figures)

State	Number of beef cows and heifers two years old and over	Number of beef calves January 1	Number of calves per hundred cows and heifers January 1
1. Texas*	2,181,359	903,084	41
2. Iowa	848,914	844,656	100
3. Nebraska	828,853	682,265	82
4. Kansas	672,023	542,216	81
5. New Mexico*	664,329	249,545	38
6. South Dakota	573,589	467,986	82
7. Missouri	533,675	445,199	83
8. Colorado	529,186	325,033	61
9. Oklahoma	490,689	309,025	63
10. California	441,059	242,315	55
11. Arizona*	429,480	153,137	36
12. Montana**	384,148	275,564	72
13. Illinois	361,909	340,425	94
14. Wyoming**	299,126	206,741	69
* Three southern range.....	3,275,168	1,305,766	40
** Two northern range.....	683,274	482,305	71
Seven western states.....	4,928,687	2,355,419	48
Seven central states.....	4,309,652	3,631,772	84
Total	9,238,339	5,987,191	65
Total United States.....	12,624,996	8,607,938	68

This table indicates that Texas sells a large number of calves prior to January 1, and that Iowa buys a considerable number of calves. However, due allowance should be made for the fact that under range conditions fewer calves are dropped per 100 cows, and losses of calves from disease, exposure, predatory animals, poison, and other causes are greater than in the central states, but these factors cannot cover the wide differences which occur in the ratios between calves and cows in many of the 14 states.² At the bottom

¹ Compiled from U. S. Dept. Agr. Yearbook, 1921, pp. 248, 250.

² Figures covering the average calf crops and average losses of calves up to 12 months of age in various states are given by Barnes and Jardine in U. S. Dept. Agr. Rpt. 110, p. 27, and by Cotton and Ward in U. S. Dept. Agr. Rpt. 111, pp. 41, 51. Applying these figures, and assuming that the number of breeding females was the same in 1919 as in 1920, then the number of January calves produced per 100 breeding females in Iowa was 86, Nebraska

of the table appears a comparison of the northern range with the southern range, of the central states with the western states, and of the 14 leading states with the total for the United States. The latter indicates that the 14 states supplied over 275,000 calves to other states in 1919. This assumes that conditions are equally favorable to calf production in the 14 states and in the country as a whole.

Conditions suitable to beef cattle breeding.—"The importance of beef cattle in the agriculture of this country rests chiefly upon their ability to convert coarse forage, corn, grass, and other products of the land, either unfit or not wanted for human consumption, into a valuable and much desired food."¹ The raising of beef cattle is extensively practiced on cheap, unimproved lands, especially on the cheap grazing areas of the West. Improved, high-priced lands in the farming areas, particularly in the corn belt, produce feed much more abundantly than the cheap grazing areas, including large quantities of roughage such as corn stalks, hay, and straw, and the larger part of this roughage must be fed to cattle if it is to be used at all. A considerable number of eastern, southern, and corn-belt farms include more or less rough land which may be used to best advantage as pasture for a beef breeding herd.

Thus breeding herds of beef cattle are maintained not only in the Southwest and West, but also in the Central West, and in the East and South. Steer calves produced in the West are frequently kept there until they are three or four years old to mature them so that they will fatten on grass, because young, growing animals do not fatten on grass alone. On the other hand, steer calves produced in the corn belt must be developed and finished quickly. On high-priced land they cannot be developed profitably by the slower

78, Kansas 81, New Mexico 59, South Dakota 85, Missouri 89, Colorado 64, California 69, Arizona 52, Montana 71, Illinois 88, and Wyoming 69. Similar figures are not available for Texas and Oklahoma. Assuming that conditions are as favorable for production of calves in Texas as in New Mexico (they are probably more favorable), then Texas sold 18 calves per 100 cows, New Mexico 21, South Dakota 3, Missouri 6, Colorado 3, California 14, and Arizona 16; while Iowa purchased 14 calves per 100 cows, Nebraska 4, Montana 1, and Illinois 6. This would mean the sale of about 40,000 calves by Texas, the purchase of about 120,000 calves by Iowa, and sales or purchases by the other states in proportion to the figures given. The writer does not believe the above figures relative to corn-belt calf crops to be accurate as applied to some of the corn-belt states, being too high when applied to the state as a whole, but in a broad, general way they indicate the allowances which should be made for differences in numbers of calves dropped and for losses in western as compared to central states. If the corn-belt figures are high, the movement of western calves into corn-belt states was larger than the above estimates.

¹ Sheets, Baker, Gibbons, Stine, and Wilcox: Our Beef Supply, U. S. Dept. Agr. Yearbook, 1921, p. 227.

method of the West. In other words, most corn-belt beef calves must be marketed as baby beeves.

Selection of beef cattle for breeding purposes.—When breeding for beef, the producer must use good cattle of the beef type. Attention must be given to the selection of both the cows and the bulls, and an effort must be made to breed for market what the market wants and will pay for in amount sufficient to return a profit. In some years, feeders of cattle find it more profitable to buy a rather low grade of cattle for feeding purposes, although as a general rule, it pays best to feed high-class cattle that will sell at the top of the market, or near the top, when finished. Breeders of cattle are confronted with no such problem as to what to aim for in breeding; they should always try to breed the best. Breeding herds are not so easily or quickly changed to suit fluctuations in market demands as are cattle in the feeder's hands; hence, breeders abide by the general rule that greatest returns come from the production of the highest grade of cattle, and on high-priced land especially, these are the only cattle which can be bred at a profit.

When the object of the breeder is to produce calves to be fed for the market, the cows in the herd are purebred only in rare instances. The 1920 census reported that about 3 per cent of the beef cattle of the United States are purebred and registered (recorded in the herd books of the breed record associations).¹ Purebred cattle are not so numerous as to permit their widespread use, and it is impracticable to advise that purebred cows shall constitute the common herds of the country, nor would it be possible to bring about that condition for many years to come. By all means, however, the cows in such herds should be high grades of some one of the beef breeds.

Ancestry and its importance.—Cattle may be classified into the following groups, according to their ancestry: (1) Purebreds, (2) crossbreds, (3) high grades, (4) grades, and (5) scrubs.

A **purebred** animal is a member of a breed, and is registered or eligible to registry in the herd book of that breed. Second, the purebred animal usually possesses a distinctive and useful type. Third, it is descended from a long line of ancestors specially selected by the

¹ The percentage of beef cattle which are purebred and registered varies widely in different states. According to the 1920 census, the ten leading states in numbers of registered purebred beef cattle, and the percentage of beef cattle registered in each are: Iowa 5, Texas 1.9, Missouri 4.9, Kansas 3.9, Nebraska 3, Illinois 5.7, South Dakota 3.2, Minnesota 6, Oklahoma 3.1, and Indiana 4.9. States having the highest percentages are: Massachusetts 11.7, New Hampshire 10.4, Vermont 8.5, Wisconsin 7.9, and Maine 7.5. The lowest in percentages are: Florida 0.27, Louisiana 0.63, Arizona 0.74, Delaware 0.9, and Georgia 0.9.

men who founded and developed that breed, these ancestors being of the same type as itself, which fact explains why the animal may be termed a "purebred." Fourth, being backed up by an ancestry of useful animals like itself, it has the power to reproduce this useful type in its offspring, this power or ability being called "prepotency." As it is a rule of breeding that whatever characters an



FIG. 51.—Old-time Texas long-horn, formerly a prominent feature on the American cattle markets. Early range cattle were of this type. They had very long horns, long legs, thin flesh, and narrow bodies. Through the continued use of purebred bulls this early type has practically disappeared.

animal inherits from its ancestors will be transmitted to its offspring, we at once realize the purebred's power for good when used as a breeder. The terms "full blood" and "thoroughbred" are often erroneously used in place of the word "purebred."

A **crossbred** animal is one whose sire and dam were both purebred, but belonged to different breeds. A cross between a Shorthorn bull and a Hereford cow, for example, produces a crossbred calf.

A **scrub** animal is one that bears no evidence of good breeding—one without any purebred ancestors, or, at most, very few and very distant ones. Its ancestors were a miscellaneous lot, of all shapes, sizes, colors, and sorts, few if any of which were useful animals. Hence, scrub animals are usually of indeterminate type and little value. Calves sired by scrub bulls and out of scrub dams will be as worthless as their ancestry.

A **grade** animal is one produced by mating a scrub female with a purebred male. If this grade animal is a female and is in turn mated with a purebred male of the same type (and preferably of the same breed) as its own purebred parent, the result will still be a grade. Grade animals possess from 50 to 75 per cent pure breeding.

A **high-grade** animal is one produced from a scrub foundation by three or more successive crosses of purebred sires of the same type and preferably of the same breed. High grades possess 87.5 per cent or more of pure breeding. High-grade beef cows and heifers approach purebred beef cows and heifers in their ability to produce high-class beef calves when mated to good purebred beef



FIG. 52.—Crossbred beef cattle. These are representatives of the noted “blue grays” so popular in the British markets. They were sired by a Short-horn bull and their dams were Galloway cows.

bulls. Such matings insure not only high-class calves but calves of uniform type and uniform ability which contrast sharply with the variegated assortment of calves produced by scrub herds.

As stated by Wentworth, Munnecke, and Brown,¹ “The success of growing cattle for the market depends in a large degree on the kind of calves that are produced. Unless the right foundations in blood and type are laid, no amount of feeding by the professional feeder or skill in killing and cutting by the packer can make up for the original deficiency. Unless proper mating is made at the start, choice to prime steers are rarely, if ever, produced.”

Utility value of purebred live stock.—The U. S. Department of Agriculture tabulated reports received from 525 farmers and stockmen who had used purebred sires exclusively for a number of years. These men owned about 25,000 head of breeding stock, exclusive of poultry. All their sires had been purebred for an average of nine

¹ *Progressive Beef Cattle Raising*, Armour and Company, Chicago, 1920, p. 22.

years. About 30 per cent of the female stock was purebred, the remainder being grade, crossbred, and nondescript. Thirty-six states were represented. Averages of the replies indicate that purebred animals are over one-third more efficient than common stock for utility purposes. The averages for each kind of farm live stock were as follows:¹

Superiority, based on utility alone, of purebred over common live stock

Class	Superior earning power Per cent
Dairy cattle	47.8
Swine	38.3
Sheep	37.8
Horses	37.2
Beef cattle	36.8
Goats	36.8
All classes (weighted average)	40.4

When the reports were summarized the superiority of purebreds was, in the opinion of their owners, based on the following points:

Points in which purebred animals surpass common stock

	Per cent of total comment
Better conformation and quality	14.6
Better selling price of animals	12.8
Increased production	12.1
Stock more saleable	11.9
More product for the feed	9.2
Owners' interest and pride (results in better care and greater returns)	9.2
Uniformity (factor in making sales)	8.9
Early maturity	7.8
Ease of fattening and finishing	5.7
Better prices for products	3.0
Increased vigor	2.7
Docility and ease of handling	2.1
	100.0

The grading process enables the producer of beef calves to develop a breeding herd of high grades that closely approach or equal purebred beef cattle in their utility value. Beginning with a herd of scrub cows, successive crosses of purebred beef bulls will result in the following percentages of pure and scrub breeding in each generation of descendants:

¹ D. S. Burch: Utility Value of Purebred Live Stock, U. S. Dept. Agr. Circ. 235, p. 5.

Results obtained by continued grading

Crosses of purebred sires	Percentage of pure breeding	Percentage of scrub breeding	Percentage of pure breeding added by each cross
One cross	50	50	50
Two crosses	75	25	25
Three crosses	87.5	12.5	12.5
Four crosses	93.75	6.25	6.25
Five crosses	96.875	3.125	3.125
Six crosses	98.4375	1.5625	1.5625

It will be noted that the first cross gives the resulting calf crop a 50 per cent infusion of pure breeding, whereas the sixth cross gives the resulting calf crop less than 2 per cent more pure breeding than their dams. The first cross usually brings much greater improvement into the herd than any subsequent cross. It is much easier to improve a scrub herd than a good herd. After a time the herd becomes so nearly purebred that further improvement by grading is no longer possible. When that stage is reached the breeder may secure further improvement only as the breeder of purebred cattle secures it, namely, by careful selection. This requires not only ability to judge beef cattle, but it requires also careful study of the herd in order that the best producers may be selected or retained, and the inferior and less useful ones eliminated. It is more difficult to maintain a high average of type and production in a herd than it is to develop a good herd from a scrub herd by grading.

Community and cooperative breeding.—Organization of the stockmen and farmers of a community to use the same breed and to exchange sires makes possible to owners of small herds a succession of good sires at moderate cost. Small breeders may cooperate in buying bulls, and by exchange of bulls may retain the most successful sires in service in the community. Ordinarily a bull cannot be kept in a small herd more than two or three years because his daughters are used in the herd. Communities which have a large number of good herds of the same breed attract buyers who desire a few high-class purebreds or a carload of high grades. In some instances sales are made over a wide territory. Cooperation along these lines within a community is highly desirable in many ways, but unfortunately it is the exception in this country rather than the rule.

The bull is at least half of the herd.—Herd bulls should be selected with great care. It is often said that "the bull is half the herd," and someone has added the equally true statement that "an inferior bull is all of the herd." The U. S. Department of Agriculture estimated that in 1920 there were nearly 250,000 farms pro-

ducing beef cattle which used grade and scrub bulls.¹ In breeding all kinds of farm live stock we expect the offspring to be better than the dam, and we rely upon the sire to bring about this improvement. In breeding beef cattle for the market, it is well to have good cows, but it is an absolute essential to have a good bull. We pin our hopes on him. He must be a good individual, he must be purebred, and he should come from a good line of ancestry. These three points are guarantees as to his breeding ability.

One of the most notable examples of the value of purebred



FIG. 53.—Selecting a future herd header. Only good purebred bulls should be used in any herd. These buyers are indicating the calf that is superior in masculinity, constitution, fleshing, head, bone, spring of rib, and strength of top.

bulls as herd improvers is that afforded by the history of cattle breeding on western ranges. Beginning with the old Texas long-horn stock which formed the foundation of range herds, successive crosses of purebred sires brought remarkable improvement in the beef-making qualities of western cattle. (See Fig. 51.)

The higher-priced bull is often the cheaper.—As to what price the breeder is justified in paying for a bull, that will vary depending

¹ U. S. Dept. Agr. Yearbook, 1921, p. 240.

upon the conditions. Some very satisfactory bulls have been bought at very moderate prices. If a full quota of cows is at hand for breeding, not less than \$200 should be invested in a bull, and more often it will be advisable to pay \$300, \$350, or more, rather than \$200. A small increase in the value per head of one season's crop of calves by the use of the higher-priced bull, as compared with the cheap one, will return the difference in the price of the two animals. Furthermore, when the heifers by the higher-priced sire are used in the breeding herd, improvement thereafter will be more marked and the desired standard of excellence will be attained in shorter time.

The following table¹ gives the averages by states of answers made by western stockmen to the questions indicated by the headings of the various columns in the table. This table furnishes ample proof of the fact that the average value of the live stock of a community is in direct proportion to the value of the sires used. "A stream can rise no higher than its source."

Value of beef cattle as related to value of their sires

State	Average number of bulls per 100 cows	Average value of bulls	Average number of calves per 100 cows	Average weight of steers sold from range or pasture	
				Long 2-year-old	Long 3-year-old
Arizona	6.00	\$82.00	57.00	774.0	935.0
California	3.73	94.75	73.55	968.2	1,141.6
Colorado	4.16	131.90	69.30	883.0	1,084.5
Idaho	4.00	100.00	75.00	1,000.0	1,200.0
Montana	3.44	138.00	75.80	991.0	1,211.0
Nevada	4.00	93.00	70.00	940.0	1,140.0
New Mexico	5.00	83.00	66.00	725.0	934.0
Oregon	4.04	113.35	75.74	975.7	1,186.0
Utah	4.00	93.00	69.00	900.0	1,085.0
Washington	3.72	124.15	79.48	1,032.0	1,225.0
Wyoming	5.52	160.50	73.20	937.0	1,155.0

Arizona and New Mexico use the most bulls and the cheapest bulls. These states are credited with the fewest calves and the steers produced are markedly inferior in weight at two and three years of age. Such factors as climate, feed supply, and method of management affect the character and value of cattle produced on the range, yet the predominating factor, as shown by the above table, is that of good breeding. The importance of good breeding is again shown by the fact that in Arizona and New Mexico the more progressive stockmen have spent large sums in purchasing good

¹ Barnes and Jardine: Live Stock Production in the Eleven Far Western Range States, U. S. Dept. Agr. Rpt. 110, p. 27.

bulls and this has resulted in a decided improvement in the grade of stock on the public ranges in those states within the last few years. On the other hand, many of the smaller men either turn out scrubs or have no bulls at all, and this results in low averages.

Three prime essentials.—In selecting beef animals for breeding purposes, the breeder should emphasize those points which are important to the feeder and butcher, but must keep in mind his own interests as well. The features which are of particular interest to the breeder are: (1) the possession of a good constitution, (2) thick natural flesh, and (3) early maturity. The first of these is also of much importance to the feeder, the second interests all parties concerned with beef cattle, and the third interests both the breeder and feeder. Constitution is of the greatest importance, for it guarantees thrift and vigorous reproduction. It is the cornerstone of the successful herd. By thick natural flesh is meant a full muscular development such as will expand into a maximum fleshing when the animal is fattened. Quick maturity makes possible a finish at an early age, and this prime essential in present-day beef production is characteristic of cattle that have the blocky, compact, low-set type.

Weight requirements.—When cattle intended for breeders are in high condition, the standards for weights at various ages are as follows:

Age	Weight of bull Pounds	Weight of cow Pounds
6 months.....	600	500
12 months.....	1,075	750
18 months.....	1,275	975
24 months.....	1,500	1,150
30 months.....	1,800	1,350
36 months.....	1,975	1,475
42 months.....	2,100	1,550

Breeding cattle should not be kept in high condition, but that is the only satisfactory basis for fixing weight standards. In applying these standards due allowance should be made for lack of fat, depending upon the condition of the animal. The above figures are for purebred bulls and high-grade cows such as should be used in market beef breeding herds. The weights given for bulls thus represent higher standards than those for the cows. The difference in the matured weights of the two sexes as given above, while largely due to sex, is due in part to higher average merit in the bulls than in the cows.

The beef bull.—In general appearance the beef bull is nearly identical with the steer, being wide, deep, compact, straight lined, and low set. When in use as breeders, bulls are seldom kept in high

condition, hence in studying the form certain allowances should be made for lack of fatness, as this has much to do with the appearance of blockiness and massiveness presented by the animal. The bull should have plenty of size and we should not demand the same degree of refinement in bone that is desired in the steer, yet quality should be easily apparent.¹ The hide should roll up mellow and loose in the hand, showing medium thickness, and the hair should be soft



FIG. 54.—Correct type in the beef bull. Panama 110th, champion Hereford bull at the 1922 International. Bred and exhibited by A. B. Cook, Townsend, Mont.

and fine. Even when in medium-fat condition, the fleshing should be abundant and smooth. The head should be clean-cut, wide, and short, though larger than the steer's, with heavier horns, and a more burly appearance generally. The eye shows more animation or spirit, and a more resolute expression. Such a head is indicative of masculinity which is insisted upon by all breeders, it being an evidence of potency or breeding capacity. The bull at maturity should show a powerfully muscled neck with a pronounced arch or

¹ The range cattle breeder places particular emphasis on heavy bone. The conditions under which range cattle are produced make the maintenance of size and vigor in range cattle a problem, and this the western breeder attempts to solve in part by the constant use of heavy-boned bulls.

crest, this also indicating masculinity. The crest should come forward close to the head, and the neck should be short. Masculinity is again shown in the shoulders by a heavier, more massive development than is found in the steer, yet this does not excuse a rough, prominent shoulder such as would be objectionable in the offspring when they are fed for market.

The entire front of the bull is well developed and massive, a condition which is inherited by domesticated bulls from their wild ancestors. In the wild state, a bull became the head of the herd

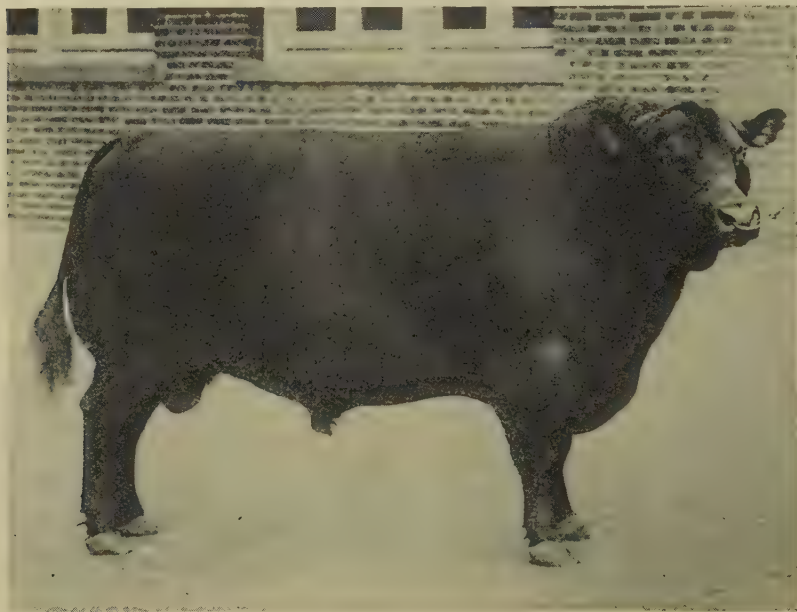


FIG. 55.—Correct type in the beef bull. Erwin C., champion Aberdeen-Angus bull at the 1913 International. Owned by W. A. McHenry, Denison, Iowa.

only by right of conquest, and his burly head, heavy horns, muscular neck, and massive front were needed to defeat his male rivals, and to protect the herd from its enemies after he had gained leadership. It was a survival of the fittest, which is nature's method of improving the wild animals. Under domestication, the masculine characters have not the same values as in the wild state, yet they are none the less valuable, because they indicate a rugged, vigorous, and potent animal—qualities highly prized by any breeder. A wide, deep chest and full middle insure a good constitution. The middle is identical in form with the middle of the steer, but more emphasis is placed upon straightness and strength of back. The hips should

be smooth, and the hindquarters should be long, level, wide, and heavily fleshed.

Great variation will be found in the manner in which bulls walk, some doing it awkwardly and clumsily, with the back humped to a marked degree, and with the legs sprawling; others are active in their movements, keeping their legs under them, and carrying themselves with little apparent effort, the latter of course being much preferred. Style has market value in a bull as in a steer, and between an animal that stands and walks properly, and one that slouches, other things being equal, the former will sell much more readily if they are priced the same, and his calves will more quickly attract buyers when they reach the market. Before purchasing a bull, the cows in the herd should be carefully studied and their weaknesses noted, so that a bull may be selected that is strong in the points where the cows show weakness.

A beef bull, well developed at a year old, may serve a few cows, but should as a rule be eighteen months old. An ordinarily vigorous mature bull will get 100 calves a year if the cows come to him at proper intervals, but when they are nearly all bred in the spring and in the fall probably 60 is about the usual limit.

The beef breeding cow or heifer.—Cows reach maturity quicker than bulls, but do not attain as much size or weight. They show more refinement at all points than do males, but in form and fleshing are nearly identical with all good beef animals regardless of sex. In selecting cows, emphasis is placed upon constitution, thick natural flesh, quick maturity, and feminine character. The head shows marked refinement, and there is a calm expression of the eye, showing a much milder disposition than the bull. As compared with steers, the horns are less developed, and the neck is not so thick and perhaps not quite so short. The shoulders are well laid in and smooth, and throughout the forequarters there is an absence of the great strength and massiveness found in the bull. The refinement of the cow's head, neck, and shoulders is an evidence of femininity, which, like masculinity in the male, is evidence of breeding capacity. "Motherly" looking cows, not too compact in form, are wanted. A coarse "steery" headed female is seldom a successful breeder. Although she may produce a calf each year, her stock is not likely to possess the high qualities that one expects.

A straight, strong back and wide, deep middle are as desirable in the cow as in the bull or steer, indeed even more so, as a capacious middle provides ample room for carrying the calf. Cows should be a little longer in the middle, a little less compact in other words,

than steers and bulls. The hips are notably different, showing more width and prominence, and this feature is often so pronounced as to cause criticism. While a wider hip is accepted in cows than in other beef animals, nevertheless care should be taken to guard against undue prominence. Cows are also usually shorter and rougher in the rump than bulls, but the rump should be as long, level, wide, and smoothly fleshed as possible.

So far as condition is concerned, it must be remembered that the breeding cow is more valuable on account of the progeny she produces than on account of her own excellence as an animal suit-



FIG. 56.—Correct type in the beef cow. Fair Start 2d, a noted Shorthorn show cow owned by George J. Sayer, McHenry, Ill.

able for slaughter, hence we do not fault her if she lacks in fatness, provided her constitution, form, and quality are good. However, the beef cow must possess the ability to fatten readily, for "like produces like," and if the cow will not take on flesh readily, then we cannot expect her calves to be profitable in the feed-lot. It is on this account that beef breeding bulls and cows are shown in heavy flesh in the show ring, thus indicating their capacity as beef producers. Beef cows are sometimes made so fat for showing that their usefulness as breeders is injured by a heavy deposit of fat about the generative organs. The practice has, therefore, been severely

criticized, yet the danger is not great if the feeding is carefully managed, and the advantages so far outweigh the disadvantages that the showing of breeding animals in high condition seems destined to continue.

In the show ring, little or no attention is paid to the udder of the beef cow, but the man who breeds beef cattle cannot ignore the cow's milk-producing qualities. The udder should be of good size and shape, with well-placed teats, and the cow should be able to furnish ample milk for her calf during at least the first six months of lactation. E. S. Bayard, a breeder of beef cattle and editor of the *National Stockman and Farmer*, has the following to say regarding the selection of beef cows and the importance of good milking qualities:¹ "Good-sized, roomy, robust cows; with breadth but not coarseness; big of barrel, loose of hide, short of leg, neat of head, mild of manner, placid of countenance, with a decidedly feminine expression, are the kind. Cows that are good milkers, as a rule, are good and regular breeders—they do not get too fat to breed. Their calves are started well, are kept going, and develop rapidly, for there is no feed for a calf or any other animal that will take the place of mother's milk. The cows which milk most and lose flesh most rapidly when suckling calves are the quickest-fleshing cows. They milk down rapidly and they recover flesh quickly when relieved of the strain of milk production. This characteristic of quick fleshing usually accompanies good milking, but not persistent milking of course. Beef-bred cows are not, as a rule, all-the-year milkers, nor is it desirable that they should be. Milk enough is vital to success, and breeders of beef cattle cannot afford to neglect it any more than they can afford to make it a leading object of their breeding. So get lady cows, feminine type, with good udders, and they can be found in all the beef breeds. Let the steery cow alone as you would the bull that lacks masculinity."

The cows which raise good calves should be retained in the herd as long as they are useful, and those which fail to produce good offspring should be sent to the butcher no matter how attractive they may be individually. The attractive fat cow that gives no milk and raises a small, scrawny calf is not worthy of a place in the herd, whereas some of the good mothers may nurse down pretty thin and look rather unattractive after they have suckled their calves for a time. When a cattle breeder designates his plainest-looking cows as the best producers in his herd he is often fully justified in doing

¹ *Beef Production*, Penn. Dept. Agr. Bul. 235, pp. 35, 36.

so. Save those that are best by test, and replace the unprofitable cows with the best of the crop of heifers.

In many instances, heifers are bred at 15 to 18 months old, but it is better practice to begin breeding them at about 21 months so that they drop their first calves at about 30 months. The period of gestation often varies from 274 to 287 days, and the average is about 280 days.

Value of records.—The feeder ought to weigh his cattle regularly, and keep careful and complete records of the weights and of all items of expense incurred in finishing and marketing, so that he may know whether his cattle return him a profit or were fed at a



FIG. 57.—Correct type in the beef cow. Blackcap of Glenrock 3d, champion Aberdeen-Angus cow at the 1929 International. Exhibited by Harrison and Ryan, Harlan, Iowa.

loss. In either case, the records are available for study, and when the next lot is fed, comparisons may be made and benefits derived from past experiences. This is all the more important in the case of feeders who breed their own calves, for then such records are doubly valuable as they greatly assist in determining the producing qualities of the animals in the breeding herd. If the breeder has a chance to see the carcasses yielded by cattle of his own breeding, he should avail himself of it and talk with some well-qualified butcher regarding their merits and faults. By such progressive methods

will the breeder forge ahead and obtain the maximum profit and satisfaction from his business.

In conclusion, there is good opportunity for profit in beef production, and the soil needs the fertility which comes from the keeping of live stock. The factors necessary to insure success in beef production are (1) good pastures, (2) better care of pastures, (3) utilization of corn stalks through the use of a silo, (4) the growing and feeding of alfalfa, (5) keeping the best heifer calves for breeding purposes, (6) buying only good, purebred, beef bulls to mate with them, and (7) staying by beef production year in and year out, making it a permanent part of farming operations.

CHAPTER X

DAIRY TYPE

Dairy animals that are correct in type present a marked contrast to beef animals. The body and back are longer and much narrower, the thighs are thin, the neck longer and more slender, and in all parts the animal is lean and angular, whereas the beef animal is thick-fleshed and smooth. The lean, angular appearance is highly desirable, but an emaciated condition is sharply discriminated against because it indicates a lack of health and vigor. Both males and females are rather sharp at the withers, deep ribbed, medium in length of leg, and well divided between the hind legs. There should be no bulge to the thigh, and no tendency toward the development of what is called the "twist" in beef cattle. There is a limit to an animal's feeding and digestive capacity, hence one animal cannot produce both beef and milk in maximum quantities. Breeders of dairy cattle want the dairy cow to do one thing only; they discriminate against beefiness just as sharply as they favor evidences of large milk capacity.

The Dairy Cow

Dairy cows may be judged by two distinct methods. One method consists of keeping records of the cow's production, including the duration of the lactation periods, the pounds of milk given at each milking, and the results of the Babcock tests for butter-fat. Records may also be kept of the quantities of feed consumed and the cost of the feed-stuffs used, so that at the end of each year an accounting may be made with each cow, and her profitableness or unprofitableness accurately determined. This method gets right at the cow's producing capacity and removes all doubt concerning her right to a place in a producing herd. It is also much used in estimating a cow's value for breeding purposes. This method may be called judging by performance.

The other method of judging dairy cows consists of a detailed study of the animal, and an examination for certain characteristics which are evidences of milk-producing capacity. If the fifty highest-producing dairy cows in the United States were assembled so that comparisons might easily be made, considerable variation would be found among them in form, quality, udder, and other

points. Yet through all these cows would run certain well-defined characteristics which dairymen have come to know are associated with heavy production. These characteristics may be causes of the heavy yield, or merely incidental correlates, but in either case they are evidences of productive capacity, and are valuable aids in judging dairy cows. Many dairymen keep no records of the production in their herds, and rely solely upon an examination of the individuality when additional cows are purchased. There are other men who ridicule the idea of judging a cow by any other means than

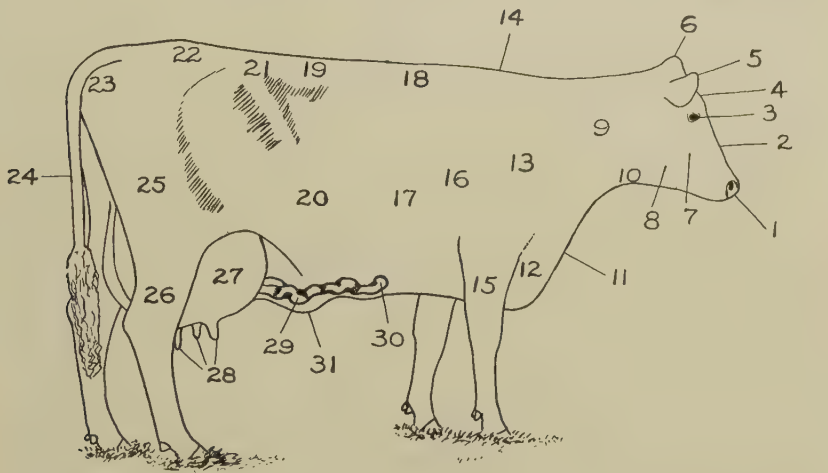


FIG 58.—Points of the dairy cow.

- | | | | |
|-------------|--------------|-----------------|---------------|
| 1. Muzzle | 9. Neck | 17. Ribs | 25. Thigh |
| 2. Face | 10. Throat | 18. Back | 26. Hind leg |
| 3. Eye | 11. Dewlap | 19. Loin | 27. Udder |
| 4. Forehead | 12. Brisket | 20. Barrel | 28. Teats |
| 5. Ear | 13. Shoulder | 21. Hip or hook | 29. Milk-vein |
| 6. Poll | 14. Withers | 22. Rump | 30. Milk-well |
| 7. Cheek | 15. Fore leg | 23. Pin bones | 31. Navel |
| 8. Jaw | 16. Fore-rib | 24. Tail | |

records of her performance; they will tell you of cows which score high but are poor yielders, and of other cows which score low but are big producers. However, such instances are exceptional and should not dislodge one's faith in the value of studying the individuality of dairy cows. No doubt it is wrong to rely solely upon either method of judging, for the two methods may be combined to the advantage of each, and in this way the best estimate of the value of a dairy cow is made.

The **form** of the high-class dairy cow is that of a triple-wedge. One wedge is apparent from a side view; the cow is much deeper behind than in front, so that if the top line and underline were con-

tinued on forward they would meet at a point not far in front of the animal. The second wedge is formed by a widening from breast to hindquarters, so that the side lines rapidly converge if they are carried out in front of the cow. These two wedges are sometimes secured, in part at least, by a lack of width and depth in the chest, whereas they should result solely because of much width and depth of barrel, thus giving the needed digestive capacity. Therefore the wedge form characteristic of the dairy cow is not valuable in itself, and the mere fact that a cow has it is not sufficient. The examina-



FIG. 59.—A dairy cow with utility points emphasized. Holstein-Friesian cow, Minerva Beets, five times champion of her breed at the National Dairy Show. Owned by R. E. Haeger, Algonquin, Ill. Correct form, excellent quality, a high degree of dairy temperament, and great femininity are all plainly evident in this picture. Note especially the feminine head, faultless neck, straight strong top, deep barrel, well-balanced udder, and good teats.

tion should go deeper; the wedges should be analyzed and their causes determined. The third wedge is formed by the shoulders and withers; the withers constitute the point of the wedge, and the shoulders widen out below to provide the necessary chest capacity. This wedge insures against coarseness at the withers and heavy fleshing on the shoulders. The general form of the cow is very angular throughout, due to a well-developed frame and the presence of but little flesh to give smoothness to the parts. Some allowance, however, must be made for sex and age; we naturally expect more fleshing in the bull than in the cow in milk, and the same is true of

young heifers before their first calving, and also of dry cows. Some dairymen make an effort to fatten dry cows, for the added body-fat is resorbed and converted into butter-fat when the cow again comes in milk, thus temporarily raising the percentage of butter-fat above the normal. These features, however, do not excuse any persistent beefy tendency in dairy animals, it being distinctly objectionable.

The **head** of the dairy cow should be lean, and have a broad muzzle, large nostrils, and a dished face. Compared with the head of the beef animal, there is less width and more length, the proportions of the head being medium long and medium broad. The eyes should be prominent, bright, calm, and wide apart, and the forehead should be fairly wide. The jaws should be strong, and the cheeks well muscled. The ears should be fine in texture, and of medium size. The horns should be fine and have a curve that adds to, rather than detracts from, the appearance. In Guernsey cattle, a yellowish secretion of the skin inside of the ear, and a waxy color of the horn are regarded as evidence that the butter will have a rich, golden color. The head should have a distinctly feminine expression, and in all its features should be clean-cut and sharply defined. Such a head has a chiseled appearance indicative of quality and good breeding.

The **neck** should be long and fine. The upper edge has a slight concave curve, and the lower border has a thin fold or edge of skin, called the "dewlap," extending upwards from the brisket. If the neck is short and thick, or has much depth, so as to make it appear heavy, there is a lack of true dairy type. The throat should be neat and trim, rather than full. Naturally we do not want the neck and shoulders to blend smoothly as in beef cattle, for this results from heavy fleshing.

The **brisket** of the dairy cow is much narrower and sharper than in beef cattle, and does not carry forward so prominently, the difference being mainly due to the heavy fleshing of the beef animal.

The **shoulders** should be light, that is, free from coarseness and heavy fleshing, and the tops of the shoulder blades and the spines of the vertebrae should form rather sharp and refined **withers**. The shoulders will not appear smooth, but they should not be rough and coarse. A rather open, loosely connected shoulder is associated with the open-jointed conformation desired in the dairy animal, and is a feature found in many of the record-holding cows.

The **front legs** should be of medium length, should come down straight, and the toes should point straight ahead. The pasterns should be strong. There should be no coarseness of shanks or

joints. Very often the knees come quite close together, the legs being crooked, and the toes turning out, but this is a faulty conformation and is often associated with a narrow chest and lack of constitution.

The chest gets its capacity from depth more than from width. However, the fore-rib should have at least a medium degree of arch; breeders of Holstein-Friesian cattle place much emphasis



FIG. 60.—Excellent type in the dairy cow. Guernsey cow, Langwater Dairymaid, first prize winner as a four-year-old at the National Dairy Show. Owned by C. L. A. Whitney, Albany, N. Y. Note the breedy head and neck, straight top line, shapely udder, and the quality, femininity, and dairy temperament shown in this cow. She has an official yearly record of 16,949.2 pounds of milk and 812.66 pounds of butter-fat.

upon a pronounced arch of rib. The fore-rib should carry down deep to give plenty of room for the heart and lungs. Beef cattle should fill up full and smooth with flesh behind the shoulder, but dairy cattle typically show some slight depression just behind the shoulder, although the heart-girth must be very large to insure a strong constitution. The distance between the front legs is a fairly accurate measure of the width of the chest floor, which should not be cramped, but ample, with the front flanks well filled out. In making a large flow of milk, the heart has to pump great quanti-

ties of blood which the lungs must purify, thus demanding that the dairy cow have a large chest capacity and an excellent constitution.

The **back** should be straight and strong, and have moderate width, and a fair degree of length. Dairy cattle seem put together somewhat loosely; it is not desired that they should be closely coupled or short in the back. A sway-back is sometimes said to indicate true dairy type, but there is no good argument in support of this view; it is logical that cows with big middles should have straight, strong tops. Some dairymen also desire that the backbone shall stand up prominently along the back, loin, and rump, and terminate in a long tail. The argument is that a well-developed backbone encloses a large spinal cord, and as a large nerve branches off at the last dorsal vertebræ and goes to the udder to control operations there, a large spinal column is accepted as evidence of proper development of the nervous system, which, in turn, is supposed to signify increased efficiency on the part of the cow as a milk machine. Whether the size of the brain, spinal cord, and branching nerves, rather than their quality and texture, determines the efficiency of the nervous system may be questioned, and as for the course of reasoning showing the relation between length of tail and quantity of milk yield, the reader may take it for what he deems it worth and form his own conclusions. In any event, there are many other ways of estimating a cow's value, the reliability of which are better substantiated. However, a prominent backbone is valuable as an evidence of true dairy temperament, or freedom from beefiness.

The **loin** should be rather long, should carry up level and strong, and show a fair degree of width.

The **barrel** ought to be very deep and wide, and this is secured when the ribs are very long and reasonably well arched. There will be no such degree of rotundity as is found in beef cattle; there should be a well-developed paunch with capacity for a large amount of feed. A flat-sided conformation means a restricted capacity. The ribs do not lie close together along the side as in beef cattle, and there is more space between the last rib and the hip.

Of all the points discussed thus far, two are of vast importance; these are constitution and digestive capacity. The dairy cow is a milk machine and should be studied and operated as such. It is thus much easier, when judging, to put emphasis where it belongs and so arrive more quickly at the true worth of the animal. Milk is manufactured in the udder from nutriment derived from the

feed, and if the cow has the true dairy temperament and does not tend to take on flesh, the quantity of her milk yield will be in direct relation to the quantity and quality of the feed consumed. A large milk flow therefore necessitates full development of the organs of digestion, respiration, and circulation, the external evidences of which are a large heart-girth, a large barrel-girth, and a rather lengthy middle.

The **hips** are very prominent, and should be as wide as possible. Narrowness across the hips is often associated with a lack of width



FIG. 61.—Type and production. Jersey cow, Fauvic Star, owned by A. V. Barnes, New Canaan, Conn. Note the beautiful head, excellent lines, capacious middle, large udder, feminine character, and marked degree of quality. She produced 20,616 pounds of milk and 1,005.90 pounds of butter-fat in an official yearly test.

in barrel, and when the hips and rump are narrow, the hind legs are usually too close together, leaving little space for the udder.

The **rump** should be wide and level to insure against difficulty in calving, and should not rise strongly at the tail-head, as that conformation usually goes with the sway-back. A level rump is usually associated with a level udder. Length of rump is also very desirable; it gives symmetry to the form, and provides room for a long udder-attachment below. A narrow, peaked rump is liable to cause trouble at calving time, and, as pointed out, it brings the

hind legs too close together. At the end of the rump on either side of the tail are the pin-bones. They should be wide apart, for reasons similar to those just mentioned. From the point of the hip to the end of the rump there should be a well-marked hollow, insuring against beefiness of rump.

The **tail** performs a part in milk production by protecting from the annoyance of flies. The fleshy part of the tail should extend to the point of the hock and the brush should be heavy and long. The root of the tail should be carried on a line with the rump, showing no undue prominence or roughness.

The **thighs** should be muscular, but not fleshy. From a rear view they should be fine and there should be no fleshing between the legs to take up the space that should be filled by the udder. It is desirable that the thighs be long, and that the conformation inside the thigh be incurving. Much variation in rumps and thighs will be found in dairy animals, ranging from decided beefiness to the trim, clean-cut conformation shown by the best dairy cows.

The **hind legs** should be placed well apart, and they should come down straight. If the toes point outward and the hocks come close together, the conformation is weak and there is not sufficient room for the udder.

The **udder** of the dairy cow comes in for special attention, ranking in importance with the chest and barrel, the three being fundamental in the make-up of a successful dairy cow. The udder's size, texture, shape, and teats should be carefully studied.

Size of udder.—The udder should be large, carrying well forward along the belly, and extending far backward and high up between the hind legs. When a side view of the cow is taken as she stands in natural position, the udder should carry out far in front of the hind legs, and the swell of the rear quarters of the udder should be plainly evident back of the leg. The udder should also be wide in its attachment to the body throughout, and there should be much fullness of udder from side to side, with good width also across the floor (lower surface) of the udder. A measurement of nearly six feet around the udder has been reported, just two inches less than the cow's heart-girth. The udders of heifers are often deceptive, having much greater capacity than the exterior indicates. This is because the udder is held snugly against the abdominal wall; but with increase in age and yield of milk, the added weight produces some relaxation of the supporting tissues, and the udder becomes more pendulous and prominent.

Texture of udder.—Two sorts of tissue mainly compose the

udder—glandular tissue and connective tissue. The former is the seat of secretory activity, and the latter serves the purpose of a framework or support. More or less fatty tissue is also present. Naturally, it is very important that there be a large proportion of glandular tissue and a relatively small amount of connective tissue. This is determined by examining the udder with the hands for mellowness, which indicates that the udder is largely glandular; or still better by having the cow milked, when the udder should show much decrease in size, and the skin covering it should shrivel. When the udder is composed largely of connective tissue, it feels firm and is referred to as “meaty,” and when it is milked out, the yield of milk is small and the udder shows little or no decrease in size. Unfortunately, meaty udders usually excel in shape and appearance, while the most glandular ones have not sufficient connective tissue to properly support them, the heavy weight causing them to hang down rather loosely to form what is called a “pendant” udder. Many large producers have such udders, whereas it is a fact that the type of udder that wins in the show ring is often lacking in milk capacity. The skin and hair covering the udder should be very soft and fine. Texture of udder is one of the most important considerations in judging dairy cows.

Shape of udder.—All sorts of sizes, textures, and shapes are presented. The most desirable shape is an evenly balanced udder, with all four quarters fully developed, and having a flat floor, instead of being cut up between the halves and quarters. There is a natural tendency for the rear quarters to develop much more than the front quarters, the latter often terminating abruptly, but the most desirable shape is one extending well forward to make what is termed a balanced udder. Udders which carry neither forward nor backward, but are small and tapering from base to teats, without any fullness, are termed “funnel-shaped” udders. Undoubtedly there is considerable correlation between shape of rump and shape of udder. A long rump goes with a long udder, a wide rump with a wide udder, and a level rump is associated with a level udder in contrast to the tipped-up form of udder so often associated with a drooping rump. Shape and balance of udder are important, but subsidiary to size and texture.

The teats and their placement.—The teats should be cylindrical, perpendicular, hang on the same level, and be placed at least six inches apart each way, so as to be easily grasped in the hand. They should be three or four inches long and of a size to make milking easy, but not too large, for udders with very large teats

are usually cut up between the halves and quarters, and this occurs at the expense of glandular tissue. When dairy cows are judged, a small amount of milk is drawn from each teat to make certain that the teat is unobstructed and free from defects not evident to the eye. Leaky teats are due to weakness of the muscles of the teat, this being an undesirable trait rather commonly met with, especially in heavy milkers just before milking time. Some udders have not only four large teats, but also one or more small or rudimentary ones. A small amount of milk may sometimes be drawn from them, as they usually spring from rudimentary glands. It is preferred that the udder have four full-sized teats, and four only.



FIG. 62.—Excellent type in the dairy cow. Ayrshire cow, Kilnford Bell 3d, twice champion at the National Dairy Show. Owned by Adam Seitz, Waukesha, Wis. Note the beautiful head of this cow, and her large, shapely udder. Her conformation indicates strength and vigor without coarseness.

In conclusion it may be said that the udder, first of all, should be large; second, it should be mellow and glandular; third, it should be well-balanced and of good shape; fourth, the teats should be of medium size and placed well apart.

The **milk-veins** are large veins passing forward from the udder along the belly just beneath the skin, and disappearing through openings in the body-wall known as milk-wells. The position of the milk-wells varies; some are near the fore flanks, and some midway between the udder and the front legs. As will be explained more fully later, nutriment derived from the feed is carried to the

udder by the blood and is there utilized in the manufacture of milk. After the udder has absorbed those elements necessary in making milk, the blood returns to the heart through the milk-veins. It is evident that the size and development of these veins is a good index to the cow's milking capacity, hence they are highly useful in judging dairy cows. The milk-veins of young heifers are small in diam-



FIG. 63.—A combination of beauty and utility. Jersey cow, Bosnian's Anna, champion at the National Dairy Show. Owned by C. I. Hudson, East Norwich, L. I., N. Y. Her chiseled, feminine head, straight top line, deep rib, nicely balanced udder, and large veins are all noteworthy. She is especially strong in temperament and quality. Note also the correlation between levelness of rump and levelness of udder.

eter and are straight. As the heifer develops and her milk flow increases, the veins show increase in diameter, sometimes to an inch or more, they often become crooked or tortuous, and may extend forward toward the fore flanks. The degree of tortuousness varies according to the vein's diameter, small veins being nearly straight and large ones very crooked indeed. There will be at least two milk-veins, one on each side of the belly, and sometimes there will be three, the third one having a position on the middle of the abdomen between the two side veins. They sometimes show more or less branching, each branch passing forward and disappearing through its own milk-well. Although diameter of veins is probably most important, length and extension of veins are also regarded as important, indicating an increased venous development and capac-

ity for a larger flow of blood, due to the added number of milk-wells which make easy the work of handling a large circulation. Nearly all phenomenal producers have veins not only of large diameter and decided tortuousness, but also of many branches and forward extensions. Small veins, called udder veins, occur on some udders, their presence being further evidence of a well-developed mammary circulation.

The **milk-wells** vary in size to correspond with the veins, and are taken into account in judging. They should be large and easily indented when the finger is applied to them.

The **escutcheon** or "milk mirror" is that portion of the udder and thighs that is covered with hairs turning up and out, instead of down, as on the rest of the body. A Frenchman, Francois Guenon, beginning in 1814 as a boy of fourteen years, worked out in great detail what is known as the Guenon or escutcheon theory. He classified cows and bulls into ten orders and each of these again into four grades, depending on the size and shape of the escutcheon. To each of these orders and grades he ascribed certain values. He also attached certain values to the location of the tufts, ovals, or swirls in the hair on the thighs, making seven additional classes of these. Guenon claimed to be able to tell accurately the producing ability of the cow, and it is said that in tests before various agricultural societies in France he was very successful in proving his theory. The escutcheon theory was formerly highly credited by many dairymen, and in rather recent years at least one agricultural college published a score card for dairy cows that gave about 50 points out of 100 to the escutcheon.

Modern tests have found this theory to be altogether lacking in accuracy. At the present time most score cards used by colleges allow only one or two points to the escutcheon. Some have omitted it from consideration altogether, and this seems entirely justifiable, as the escutcheon theory may be rightly regarded as a quack theory.

The **quality** of dairy cows is shown in the hide, hair, ear, horn, head, and bone, the same as in beef cattle. The dairy cow has a thinner skin than the beef cow, and it should also possess a maximum of mellowness and oiliness. An oily hide is something of an evidence of milk rich in fat; and an abundant yellowish secretion about the udder, inside the thighs, around the eyes, inside the ears, at the root of the tail, and below any spots of light-colored hair indicates a rich butter color. Opinions differ on the question of quality in dairy cattle. Some breeders aim at a very rugged

type having great constitution, medium size of bone, and a medium thick hide. This type is exemplified by many Holstein-Friesians and by the St. Lambert family of Jerseys. Other breeders desire extreme quality, and this may result in some delicacy of constitution. Perhaps this type is best illustrated by what is known as the "island type" of Jersey, which is the type developed in the native home of the breed on the island of Jersey, and also fostered by many breeders of Jersey cattle in the United States. The average dairyman will be wise to follow a course midway between the two extremes, insisting upon constitution first and then upon as much quality as may be had without delicacy.

The **temperament** is of much importance. Temperaments are of two kinds—sanguine and lymphatic. The sanguine temperament is characterized by a strong, frequent pulse, firm flesh, and active movements. The lymphatic temperament is featured by a rather sluggish circulation, fleshiness, thicker skin and coarser hair, slow movements, and quietness. The sanguine temperament is possessed in marked degree by the best dairy cattle, while beef cattle have the lymphatic temperament. The best evidence of true dairy temperament is a lean, angular appearance in all parts of the animal. A dairy bull, a young heifer, or a dry cow may show some degree of fleshiness without being seriously faulted for it, but a cow well advanced in a lactation period should be free from beefiness, even when fed to the limit of her capacity. This is a good indication that she is an economical milk producer.

The **disposition** varies greatly in different individuals. An irritable, kicking, fence-jumping cow is not expected to make much of a record as a milk and butter-fat producer. She uses too much of her energy in performance that has no market value; the making of milk is a secondary matter with her. Such cows consume little feed and exhibit a fastidious appetite; in short, they are not useful cattle, there being too much waste of energy in nervousness and bad temper. In contrast to such cows is the cow that never moves faster than a walk and is gentle and easy to handle. She spends lots of time chewing her cud and is always busy making milk. She is a useful, profitable cow, provided she has the conformation which enables her to work successfully. The irritable cow has an uneasy and wild expression of the eye, and carries her head high. She is usually switching her tail whether it is fly-time or not. Proper disposition is indicated by a calm eye, and by carriage of the poll of the head on about the same level as the withers. If the head is carried high it indicates nervousness, while a head

carried low indicates quietness carried to the extreme of sluggishness.

The size of dairy cows varies between wide limits. The holders of the highest records in milk and butter-fat production are large cows, which is a condition naturally to be expected, but does not signify that small cows are necessarily less profitable. The dairyman cares not so much that his cows are large and hence large



FIG. 64.—An inferior dairy cow. Note the staggy head, coarse neck, uneven top line, small barrel, coarse sloping rump, beefy thighs, and small funnel-shaped udder. Her wedge from the side view points the wrong way.

yielders, as that the yield be made economically; he studies the production in relation to the feed consumed. Small cows not only yield less, but eat less, and may be as profitable as large cows. The latter have an advantage in that they can profitably consume proportionately more roughage, and fewer of them need be kept to produce a given quantity of milk, requiring fewer stalls and slightly less labor. On the other hand, if the calves can be sold at a profit, the herd of smaller cows will realize more income from this source.

The Dairy Bull

The features of dairy type as they apply to the dairy cow having been fully discussed, and the fundamental points of dairy type

having been set forth in that connection, the requirements for the bull may be presented more quickly. In **form** the bull should be rather long and moderately wide, with a deep rib, moderate length of leg, and rather angular body. His build should insure an excellent constitution, barrel capacity, strength of back, style, and vigor, with no indications of coarseness or beefiness. The **head** should be decidedly masculine in its proportions and expression, and have a wide muzzle, large nostrils, large, bright eyes with a courageous expression, and clean-cut features. In all breeds except the Ayrshire, the masculine head will have short, stubby horns. The **neck** should be strong and the crest heavily developed.

The **brisket** shows more width, depth, and prominence than in the cow, in keeping with a masculine development of the fore-quarters. The **shoulders** are deeper and more heavily developed, but should not be beefy. The **withers** show more width than in the cow, yet tend to be fine and free from flesh. The **front legs** should be straight, of moderate length, and have fair width between. The **chest** should be moderately wide and very deep. The **back** should be moderately wide, fairly long, and carried up straight and strong. The top line of the dairy bull usually rises higher over the withers and neck than over the back and loin, and the first impression may be that the animal is sway-backed, but upon further study the observer often finds he has been misled by the rise over the withers and crest. No marked covering of flesh should be found on the back, and the backbone should be plainly evident.

The **loin** should be long, level, and medium wide. The **barrel** should be deep and well developed, but need not show as much capacity as demanded in the cow. The **hips** are only moderately wide, the points being much less prominent than in the cow. The **rump** should be long, level, and medium wide. The **thighs** may be slightly heavier than in the cow, but any considerable degree of thickness is sharply criticized. Some dairy bulls almost rival beef bulls in the amount of fleshing shown in the hindquarters, and such animals are distinctly not of true dairy type in conformation and temperament. A dairy bull should carry no more fleshing than is permissible in a dry cow or in a heifer before her first calving. The bull should be well divided between the hind legs, and should have rather flat, trim thighs. The **hind legs** should be placed rather well apart, and should be straight and of medium length.

In common with the males of nearly all species of animals classed as mammals, the dairy bull has miniature teats called **rudimentaries**. These are located in front and on each side of the scro-

tum, there being two on a side. They vary in length from mere buttons to an inch or more. Some persons attach much significance to the rudimentaries, believing that their position and size indicate the shape and capacity of udder which will be shown by the bull's daughters. It is not established that the rudimentaries really have such a significance, and many persons give them no attention in judging. Dairy bulls also have small veins on the belly corresponding to the large milk-veins of the dairy cow.



FIG. 65.—Excellent type in the dairy bull. Holstein-Friesian bull, Oak De Kol Ollie Homestead, twice champion at the National Dairy Show. Owned by Iowana Farms, Davenport, Iowa. Note especially his strong conformation, good head, well defined withers, level loin and rump, long quarters, great depth of rib, and strong constitution. He is a very large, rugged bull with symmetry, quality, style, masculinity, strength, and vigor.

The **quality** of the bull is very important; it should be easily apparent in a loose, mellow hide, and a reasonable degree of quality is also wanted in head and bone. Coarseness is an evidence of lack of good breeding. In **disposition**, dairy bulls are much less quiet and trustworthy than beef bulls, often being ill-natured and sometimes unruly. This does not subject them to criticism unless they become dangerous and difficult to handle, but is accepted as an evidence of masculinity.

The individuality of the dairy bull is certainly somewhat significant of his value, but it reveals less of the animal's ability to

perform his function than does the cow's individuality when it is studied in relation to function. The bull is only valuable as a progenitor of heifer calves that will develop into heavy milkers. What points, therefore, in the individuality of the bull are evidence that he will sire high-producing cows? It may as well be stated first as last that it is impossible to determine in any accurate manner from the bull's individuality what his breeding qualities, as



FIG. 66.—Excellent type in the dairy bull. Guernsey bull, Ladysmith's Cherub, three times champion at the National Dairy Show. Owned by D. D. Tenney, Crystal Bay, Minn. Note his masculine head and neck, great length, good depth, strong top, and long level rump, and his style, quality, character, and vigor.

they relate to milk flow, will be. There are far more reliable sources from which to form such an estimate and these will be discussed later. Nevertheless, it is important that the dairy bull show a rugged constitution, ample digestive capacity, strength of conformation, and absence of beefiness, these being essential points desired in his female offspring. If he is faulty in any of these respects, we may reasonably suppose that his daughters will be similarly deficient. He should be masculine in order to insure potency. Having all these points of individuality, it is still a question as to what sort of performance may be expected from his daughters.

CHAPTER XI

THE SECRETION OF MILK

Milk is secreted by the mammary glands or udder of the female after the birth of young, the secretion continuing until the young are mature enough to live on ordinary food. All animals which have mammary glands are classed as mammals, and this group of animals presents wide variations in the number, position, capacity, shape, and prominence of the glands. The mammary glands are present in the male in rudimentary condition, although, in abnormal cases, milk is secreted by males. Milk is easily digested and very nutritious, and no food for the young animal is equal to its mother's milk. The highest development of the udder is found in the dairy cow, the extreme development having been largely secured by careful breeding; the lactation period has become prolonged, and the daily yield and quality of milk have been much improved. Cows have been known to secrete over 150 pounds of milk in a day, their own weight in less than two weeks, and over 15 tons in a year.

Exterior of the cow's udder.—The cow's udder consists of four mammary glands, usually referred to as the "quarters," and sometimes there are one to four rudimentaries, all arranged in pairs on opposite sides of the median line of the body. The udder begins a few inches behind the umbilicus and continues backward and upward between the legs. The right and left sides are divided on the exterior by a well-defined line or groove, but the line of separation between the front and rear quarters is not so pronounced. The appearance of size depends partly upon the strength and shape of the abdominal wall; if the wall is weak, the udder is forced downward and backward and there is a seeming increase in size. This sometimes accounts for the apparently sudden development of a large udder after the second or third calving. The skin covering the udder is very thin and elastic, and the hair is finer, softer, and shorter than on other parts of the animal. The skin covering the teats bears little or no hair, and is often of a darker color than upon other parts.

Structure of the cow's udder.—When dissected, the right and left halves of the udder are found to be enveloped in strong, fibrous capsules. The fibers of the two capsules intermingle somewhat,

and are prolonged upward to the median line of the body to form a ligamentous support and partition, the two halves thus being made distinct. The quarters on each side are not so distinctly separated, there being no such well-developed partition as between the halves, nor can the line of separation be seen unless the tissues are stained. Dr. A. W. Bitting of the Indiana Experiment Station injected different colored liquids through the teats and found that the liquids did not leave the quarter, his investigation showing



FIG. 67.—Cross-section of cow's udder. a, Body of gland; b, milk cistern; c, cavity of teat; d, duct of teat; e, inter-mammary groove; f, septum between glands; g, supramammary fat.

that a rather distinct transverse partition exists. It follows that milk drawn from any teat must be produced in its quarter, although there is slight communication between the smaller ducts in the upper parts of the two quarters on a side. Between the quarters of the same half, the capsule sends off a rather incomplete transverse partition common to both, and there are numerous other reflections of the capsule inward from all sides to serve as a supporting framework for the gland tissue and to form the milk cisterns and ducts.

Structure of the teat.—The tissues of the capsule are pro-

longed downward, becoming greatly thickened, to form the walls of the teats. The teat is cylindrical or conical in shape, variable in length and diameter, and placed at the lowest portion of the gland. Its shape and size are independent of the size of the gland. It is very elastic and is covered with a tough, close-fitting, thin skin. Through its center runs a duct called the "teat-canal," having a capacity, when distended, of from 1 to 1½ ounces in moderate-sized teats. There are both circular and longitudinal muscle fibers, and at the lower end the circular fibers form an involuntary sphincter muscle, the function of which is to keep the teat-canal closed under ordinary pressure. At the upper end of the teat is another involuntary sphincter muscle, but it does not completely close the canal, and sometimes a third is found farther above. The sphincters are sometimes so relaxed that very slight pressure is sufficient to open them, and the cow leaks her milk; of other cows the reverse is true, making them hard milkers.

The milk-cistern, ducts, and alveoli.—Above the teat is a reservoir, called the "milk-cistern," seldom holding more than half a pint. This cistern is divided into pockets of various sizes into which the large milk-ducts empty. At the point of entrance of these ducts are sphincter muscles, and while they cannot entirely close the openings, they may very nearly do so, and in this way the cow is enabled to "hold up her milk." These large ducts ramify to all parts of the gland and anastomose (intercommunicate) freely; and at the intersections are still other voluntary sphincter muscles. A strong effort on the part of the cow is required to close the larger ducts in the lower part of the udder, but a slight effort will close the smaller canals further up in the glands. Cows differ greatly in their control over these muscles and in their disposition to exert it. The most common causes of holding up milk are fright, the presence of strangers in the stable, lack of familiarity with surroundings, irregularity in the time or manner of feeding or milking, and sexual heat. With some cows it becomes a habit, much injuring the usefulness and milking capacity of the animal. The large ducts subdivide into smaller ducts, and these again into smaller ones, until they terminate in groups of small sac-like bodies known as the "ultimate follicles," "acini," or "alveoli." The teat-canal, milk-cistern, and ducts are lined with columnar epithelium.

The alveolus (plural, alveoli) is the sacculated distention found in groups of three to five on the end of the minute milk-ducts. It is the essential part of the gland. It is lined by a single layer of epithelial cells which are especially concerned in milk production.

The alveolus is only 1-30 of an inch in diameter, and its cavity is from 1-250 to 1-100 of an inch in length and from 1-1,300 to 1-800 of an inch in diameter. New ducts and alveoli may be formed up to about the fifth or sixth year, thereby increasing the producing capacity of the cow.

The entire gland may be compared to a large bunch of grapes; the main duct of the gland branches very much as the stem of the bunch of grapes branches; and just as the branches and sub-branches of the stem lead to the grapes, so the branches of the duct lead to the alveoli of the gland. If we pack the bunch of grapes in a small basket of sawdust, so that the sawdust fills up loosely the spaces between the individual grapes and the branches

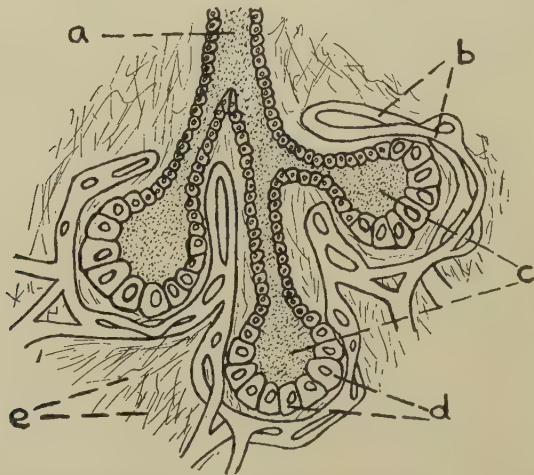


FIG. 68.—Where milk is made. Group of alveoli. a, Duct; b, capillary network; c, alveoli; d, epithelial cells; e, fibrous tissue.

of the stem, we may develop our comparison further; the sawdust stands for the connective tissue in which the ducts and alveoli are embedded, and the basket stands for the capsule.

The arterial circulation.—The mammary glands are abundantly supplied with blood. The blood leaves the heart through the posterior aorta, common iliacs, and external iliac, which carry backward to the region of the hips. The external iliac there divides into two arteries, one of which, the prepubic, divides into the two pudic arteries, the external one of which passes down the thigh and gives off a branch, known as the mammary artery, which enters the top of the udder from the rear. The mammary artery has four large branches, one for each quarter of the udder, and

there is also a small branch for each rudimentary gland. The large branches subdivide within the gland tissue.

The venous circulation is more complex than the arterial. The blood is collected from the capillaries by from 14 to 17 large veins which empty into the mammary vein running parallel with the mammary artery at the top of the udder. The mammary vein is divided into two parts which encircle the top of the udder and connect in front and behind like a rope tied around it. From this circuit of veins the blood returns to the heart by two routes. One route leads out to the rear of the udder, then up to the region of the hips, and thence to the vena cava and the heart, the veins along

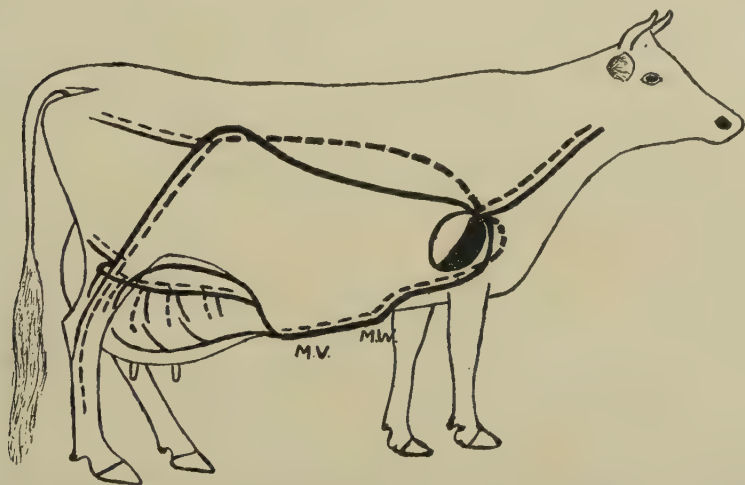


FIG. 69.—Circulation to and from the udder. The broken lines represent the arteries which carry blood containing the nutritive material to the udder where it is manufactured into milk. The heavy black lines represent the veins which carry the blood back to the heart. Note that there is but one route from the heart to the udder, whereas there are two routes from the udder to the heart. M. V., milk-vein; M. W., milk-well.

the route being parallel to the arteries through which the blood came, and being similarly named. The other route is already familiar, leading out in front of the udder through the large subcutaneous abdominal veins (milk-veins) which pass through the chest wall and become a part of the internal thoracic vein, reaching the heart by way of the anterior vena cava. The direction of the blood in the encircling veins at the top of the udder is determined by the valves in the vessels. The larger volume of blood passes through the milk-veins, thus bringing them into great prominence. During pregnancy, the pressure of the uterus tends to interfere with the circulation through the posterior vessels, and

this tends to further increase the size of the milk-veins. Inasmuch as the blood may return to the heart posteriorly, it is possible that a high producer may have small milk-veins, but this is not likely to occur. Cows with large milk-veins are large producers, and cows with small milk-veins may be large producers.

Nature and composition of milk.—Cow's milk is an opaque, yellowish-white fluid devoid of odor except for a short time after its extraction. When fresh, it is slightly sweet and has a slightly alkaline reaction. Under the microscope, milk is found to be a fine emulsion of fat, a quart of milk being estimated to contain 2,000,000,000,000 fat globules, and the cow that gives two gallons of milk per day must therefore secrete at the rate of over 175,000,000 fat globules per second. The composition of milk varies a great deal; there are differences between breeds, differences between individuals, and differences in the milk from the same cow at different times. As lactation advances, the daily milk yield decreases, but the percentage of fat constantly increases as does the percentage of all solids. The specific gravity of average milk is 1.032 and its composition is as follows:

Milk	{ Water 87 per cent		
	{ Solids 13 per cent	{ Solids not fat 9.1 per cent	{ Ash .7 per cent
			{ Casein 2.7 per cent
			{ Albumin .7 per cent
		{ Fat 3.9 per cent	{ Sugar 5.0 per cent

The results of various American experiments indicate that the average composition of the milk of the various breeds is as follows:

Breeds	Solids Per cent	Fat Per cent
Jersey	14.70	5.35
Guernsey	14.71	5.16
Shorthorn	13.38	4.05
Ayrshire	12.61	3.66
Holstein-Friesian	11.85	3.42

The quantity of milk given by the different breeds is almost inversely proportional to the fat content, so that the total quantity of solids and fat is nearly the same for all dairy breeds. The highest average percentage of fat in a regular milking that has been reported is 10.7, and the cow did not give milk of this richness regularly. In a few cases, tests showing 9 per cent have been made and it is only rarely that a cow averages 7 per cent.

Secretion of milk.—The udder is a true organ of secretion. Milk is not merely strained from the blood, but contains substances

not found in the blood, these being formed in the gland itself. Surrounding the alveoli are capillaries, and through the walls of the capillaries the fluids of the blood pass freely into the cavity of the alveoli by osmosis. At the same time, the epithelial cells lining the alveoli are the seat of secretory activities which produce some of the most important constituents of the milk. Thus milk is formed partly from the osmosis of blood serum and white blood corpuscles directly into the cavity of the alveolus, and partly by a chemical elaboration by the epithelial cells. The water from the blood serum passes out of the alveolus, carrying with it some of the mineral constituents of the blood in solution, and a part of the albumin of the blood serum. During its passage from the capillaries to the cavity of the alveolus, by far the larger part of the albumin of the blood is changed by the epithelial cells to the casein of milk. These cells also secrete globules of fat, having an average diameter of about 0.0001 of an inch. Small amounts of fat may also be carried over directly by the blood and appear in the milk without change. Only minute quantities of sugar are found in the blood, hence milk-sugar is no doubt also elaborated by the secretory cells of the udder.

Milk secretion is not perfectly understood in all its details. In some of its phases, milk secretion is undoubtedly a continuous process, but the agitation of the udder at milking time seems to be very essential in completing the process of milk manufacture. Between milkings, the udder is engaged in certain important preliminary steps which make possible the rapid culmination of the act of secretion when the stimulus afforded by agitation is given. (The theory that milk secretion is largely the result of cell growth, division, and degeneration, is no longer held by leading physiologists.)

If an udder is cut open just before milking time, it is found that the milk-cisterns and ducts are distended with milk containing a very low per cent of butter-fat. The quantity of this milk is only a small part of the total yield which the cow would give at a milking. Agitation of the udder is necessary to complete the process of secretion. Observation of a calf, lamb, or kitten when nursing shows that considerable agitation is a prominent feature of nature's method of milking. Under this stimulus the water of the blood rushes through the walls of the alveoli and carries the butter-fat, which has been manufactured by the epithelial cells, down into the milk-ducts and cisterns, and finally through the teats. Other products of secretion, namely casein and lactose (milk-

sugar), are brought down also. The last milk drawn from the udder is the richest in fat; in one experiment, four successive samples taken during the course of milking tested 0.76, 2.60, 5.35, and 9.80 per cent of fat respectively.¹ A similar test conducted in 1921 by 15 members of the McGregor (Iowa) Cow Testing Association is reported² to have given an average of 1.79 per cent of butter-fat in the fore milk and 9.6 per cent in the strippings. These were averages for the cows on the 15 farms. On one farm the strippings tested 14.5 per cent and on another farm 12.8 per cent.

Experiments made at the Wisconsin Experiment Station in manipulating the udders of cows, after the regular milkings, resulted in bringing down considerable milk very rich in butter-fat. It was estimated that if the udders of the million cows in Wisconsin at that time were manipulated after the customary operation of milking, and if butter-fat is worth only 20 cents per pound, the value of the extra product would amount to \$6 per head annually, or \$6,000,000 for all the cows in the state.

Colostrum.—Because of more or less incompleteness of the various processes of secretion at the start of the lactation period, the first milk differs in composition from that afterwards secreted, and is called colostrum. It is thick and viscous, contains less water than normal milk, five times as much albumin, twice as much ash, slightly more fat, and about one-half the usual percentage of sugar. It has a laxative effect on the calf, useful in properly starting the work of digestion. In about one week following birth, the yield of milk usually increases and becomes normal in composition.

Stimuli to secretion.—The cow has no control over the secretion of milk, it being involuntary. During the latter part of pregnancy, the embryo calf makes very rapid growth, and the blood supply to the placenta is much increased. At that time the cow does not ordinarily secrete milk, her excess of energy being given to the growth of the embryo. When the calf is born, the demand through the placenta ceases, and the large volume of blood is turned toward the udder. A short time previous to calving, the udder of the cow shows considerable increase in size, and by the time the calf is born the mammary glands are fulfilling their function nearly to the maximum capacity. In young heifers that have never had a calf, the udder contains a watery, saline fluid. Regular attempts at milking, or manipulation of the udder with the hands, or allowing a calf to suck, may stimulate the secretion of considerable normal

¹ John W. Decker: *Elements of Dairying*, p. 38.

² *Chicago Daily Drovers Journal*, Aug. 1, 1921.

milk in such young heifers. The same methods have been known to cause the secretion of a milk-like fluid by the rudimentary glands of males. Thorough milking furnishes a stimulus that causes prolongation of the lactation period, while incomplete removal of milk tends to check the secretion and shorten the milking period, and it may also cause serious inflammation. Frequent milkings tend to increase the flow of milk, but there is no special advantage in milking more often than twice a day unless the cow is a high producer and the udder becomes very much distended between milkings, as such distention acts as a check to further secretion. Regularity in milking is essential to best results, both in the amount secreted per day and in the length of the lactation period.

CHAPTER XII

VARIATIONS IN THE USEFULNESS OF DAIRY COWS

Census reports and government estimates indicate that the average cow kept for milk production in the United States produces about 4,600 pounds of milk and 180 pounds of butter-fat per year. Assuming that average butter contains 85 per cent of butter-fat, the average American dairy cow may be credited with about 212 pounds of butter per year.

The United States holds seventh place among 15 prominent countries in the average yield of milk per dairy cow, being excelled by the Netherlands with 7,585 pounds yearly per cow, Switzerland 6,658 pounds, Denmark 6,274 pounds, Great Britain 5,562 pounds, Germany 4,850 pounds, Ireland 4,816 pounds, and Canada 3,779 pounds.¹

Extremely wide variations occur in the production and profit returned by dairy cows.

Relation of production to net income.—J. C. McDowell of the Dairy Division of the U. S. Department of Agriculture tabulated 5,587 yearly records of cows owned by members of cow-testing associations in various parts of the country. These records covered a period of four years. He states² that as the average butter-fat production per cow increased from 150 to 200 pounds, the income per cow over cost of feed advanced from \$21 to \$34. Thus a gain of 50 pounds, or 33⅓ per cent, in production gave an increase of 62 per cent in income over feed cost. He states that when the production of 150 pounds was doubled, income over feed cost was tripled; and when production was tripled, income over feed cost was multiplied five times. The following table summarizes the results of his study:

Relation of butter-fat production to income over cost of feed. Average results, from 5,587 yearly records of 40 cow-testing associations

Average annual production of butter-fat	Average income over cost of feed	Average annual production of butter-fat	Average income over cost of feed
100 pounds.....	\$5.00	350 pounds.....	\$74.00
150 pounds.....	21.00	400 pounds.....	87.00
200 pounds.....	34.00	450 pounds.....	100.00
250 pounds.....	50.00	500 pounds.....	118.00
300 pounds.....	63.00		

¹ T. R. Pirtle: A Handbook of Dairy Statistics, U. S. Dept. Agr., 1928.

² Butterfat and Income, U. S. Dept. Agr. Yearbook, 1917, pp. 357, 358.

McDowell points out that if no expenses except cost of feed are considered, 1 cow that produced 450 pounds of butter-fat a year would have returned as much net income as 20 cows with an average production of 100 pounds, and had all expenses been considered, the results would have been even more striking. He found that the cost of roughage was about the same for all groups, regardless of production. The cost of grain was considerably higher for the more productive cows, but it was much lower per pound of butter-fat produced. The increased income from the higher producers should be credited in part to better feeding, but it was evidently more largely due to better cows.

Mention is made of one herd of 91 cows that in one year produced a *total income of \$58 over cost of feed, or 64 cents per cow*. One reasonably good cow can easily surpass the record of this entire herd, and how much easier it is to feed 1 cow than 91, and how much easier and cheaper it is to handle and milk 1 cow than 91! And it so happened that another member of the same testing association owned 16 cows that averaged 306 pounds of butter-fat and \$75 over cost of feed.

Tests of purebred dairy cows were conducted at the Pan-American Exposition at Buffalo in 1901 and at the Louisiana-Purchase Exposition at St. Louis in 1904. In a six-months test at Buffalo, the least profitable cow gave an average return over feed cost of 6.4 cents daily, and the most profitable cow returned 33 cents over feed cost daily, or 5 times as much. At St. Louis in a 120-day test the least profitable cow returned 1.6 cents over feed cost daily, and the most profitable cow returned 42.1 cents, or 25 times as much.

High producers consume much more feed than low producers, but they produce much more milk and butter-fat per pound of feed. This is shown by the following table¹ which covers careful, complete yearly records for five years on four farms located in Michigan, Wisconsin, Pennsylvania, and North Carolina:

¹J. S. Cates: Some Outstanding Factors in Profitable Farming, U. S. Dept. Agr. Yearbook, 1915, p. 117.

Relation of yield and feed cost per cow, to feed cost per 100 pounds of milk produced.

Pounds of milk	Number of cows	Average annual yield Pounds	Feed cost	
			Per cow yearly	Per 100 pounds milk
3,000 and under.....	16	2,349	\$43.93	\$1.87
3,001 to 4,000.....	33	3,648	49.47	1.36
4,001 to 5,000.....	78	4,596	55.00	1.20
5,001 to 6,000.....	111	5,450	59.91	1.10
6,001 to 7,000.....	109	6,445	62.85	.98
7,001 to 8,000.....	60	7,514	70.38	.94
8,001 and over.....	36	9,049	80.45	.89

Note that the feed bill was about twice as high for the best cows as for the poorest ones. But the best cows produced nearly four times as much milk as the poorest cows, and their feed bill per 100 pounds of milk was less than half that of the poorest group. *High-producing animals consume much more feed than low producers, but it pays to feed them with a liberal hand.*

Records of the champions in production.—The highest records in milk and butter-fat production are useful in showing the possibilities in the breeding, feeding, and management of dairy cattle. Sometimes these records are made regardless of economy in production, no expense being spared to give the cow every opportunity to make a high record; sometimes they have been secured at the expense of the cow's future usefulness, her constitution being undermined and her digestion permanently deranged by the forcing methods that are practiced. The value of such records is sometimes over-estimated, but they clearly indicate that the average dairy cow of the United States with her annual production of about 4,600 pounds of milk and about 180 pounds of butter-fat has plenty of room for improvement.

Following are the highest records made in official yearly tests of the various dairy breeds in the United States:

<i>Holstein-Friesians</i>			
Year	Cow	State	Production
1927	Daisy Aaggie Ormsby 3d	Michigan	1,286.23 lbs. fat
1920	Segis Pietertje Prospect	Washington	37,381.4 lbs. milk
<i>Jerseys</i>			
1928	Abigail of Hillside	Massachusetts	1,197.51 lbs. fat
1928	Abigail of Hillside	Massachusetts	23,677.0 lbs. milk
<i>Guernseys</i>			
1925	Anesthesia Faith of Hill Stead	Connecticut	1,112.50 lbs. fat
1915	Murne Cowan	Ohio	24,008.0 lbs. milk

Ayrshires

1915	Lilly of Willowmoor	Washington	955.56 lbs. fat
1915	Garclaugh May Mischief	Pennsylvania	25,329.0 lbs. milk

Brown Swiss

1929	Swiss Valley Girl 10th	Ohio	1,106.33 lbs. fat
1929	Swiss Valley Girl 10th	Ohio	27,513.6 lbs. milk

An Ayrshire cow, Crocus, is reported to have given over 45 tons of milk during her 17 years of life. Another Ayrshire cow, Annie Bert, is reported to have given over 45 tons of milk during twelve lactation periods. She also had a record of nearly 2 tons of butter. The University of Missouri had a Jersey cow, Hope of Ramapo, that in 17 years produced 78,585 pounds of milk, 4,117 pounds of butter, and 15 calves, thus bringing \$1,341.72 into the treasury. The noted Jersey cow, Jacoba Irene, in 37 months produced 42,373 pounds of milk and 2,331 pounds of butter-fat. Another noted Jersey, Sophie 19th of Hood Farm, in 6 years produced 75,920 pounds of milk and 4,353 pounds of fat, and in 10 years her production of butter-fat totaled 6,958 pounds. Lilly of Willowmoor, an Ayrshire owned in the state of Washington, produced 84,991 pounds of milk and 3,362 pounds of fat in 5 years. The Holstein cow Tilly Alcartra, owned in California, produced in 6 years a total of 156,776 pounds of milk and 4,910 pounds of fat, and in 8 years her total butter-fat production amounted to 6,250 pounds. Vive La France, a Jersey owned in Oregon, completed her sixth official test with 14,441 pounds of milk and 917 pounds of fat. Her six yearly records total 78,461 pounds of milk and 5,332 pounds of fat, the highest record to date in butter-fat production during six consecutive lactation periods. Sophie's Emily, a Jersey cow owned in New York, has produced 143,348 pounds of milk and 7,030 pounds of fat in nine consecutive lactation periods.

Cause of wide variation in production.—C. H. Eckles, formerly of the Missouri Station,¹ determined why dairy cows vary so widely in production and profit. Two cows in the station herd showing striking difference in ability were selected for the investigation. They were registered Jerseys, sired by the same bull, from dams distantly related, and they had been raised under practically the same conditions. The following table gives the facts regarding these two cows during the first two milking periods prior to the investigation:

¹ Mo. Res. Bul. 2.

Name	Pedro's Ramaposa	Pedro's Elf
Date of birth.....	Sept. 4, 1902	May 11, 1903
Age at first calving.....	29 mo.	18 mo.
Pounds milk, first lactation period.....	4,552	878
Pounds fat, first lactation period.....	238.8	44.1
Number of days in milk.....	337	131
Pounds milk, second lactation period.....	7,174	3,189
Pounds fat, second lactation period.....	377	114.8
Number of days in milk.....	365	232

During these two lactation periods, Pedro's Ramaposa produced 2.8 pounds of milk and 3.9 pounds of fat for each pound produced by Pedro's Elf. While the second milking period was in progress, an investigation was planned to determine the cause of this difference in efficiency as dairy cows. The cows were therefore bred so that the calves might be born as near the same time as possible; Pedro's Elf calved October 4, 1907, and Pedro's Ramaposa calved October 7.

Complete records were kept of the amount and composition of the feeds consumed. Each cow was fed a ration of the same composition at all times, but the amount was varied to suit the individual. As there was a possibility of the inferior cow using part of her feed for depositing fat on her body—a characteristic of inferior dairy cows—each cow was fed such an amount as would keep her at a uniform body weight. Thus the feed consumed could be studied in relation to dairy qualities only. They were fed all they would consume, unless they began to lay on flesh and gain in weight. The refused feed was collected, analyzed, and deducted from the records. Complete records were kept of the milk produced and of its composition. The same man always milked both cows. In order to eliminate another disturbing factor from such an experiment, the cows were kept farrow; had they carried calves, it would have been impossible to have accurately measured the feed requirements for milk production. A digestion trial was conducted when the cows were at their maximum production to ascertain whether any difference existed in the efficiency of digestion.

At the end of the milking period the cows were kept farrow and the same ration was fed as during the milking period; this was continued for 90 days, the feeding being so regulated in quantity as to maintain the cows at a uniform body weight. In this way the requirement for maintenance was determined for each cow. A maintenance ration is one that will maintain a resting animal at a uniform body weight; such a ration keeps up the body heat, makes repairs in the tissues, and furnishes energy for the working of the heart, lungs, digestive and other organs, and for slight movements of the body. If the dairy cow is pregnant, she

requires enough feed above maintenance to furnish nourishment for the foetus. Still more feed in excess of maintenance is necessary if she is giving milk as well as carrying a calf. Cows vary somewhat in their maintenance requirements, hence two cows consuming the same amounts of feed may have different proportions of their feed available for milk production. For instance, a restless cow has a greater maintenance requirement than a quiet one; when standing up, more feed is required for maintenance than when lying down. Many other factors affect the requirement for maintenance. It is therefore apparent that an investigation into the cause of differences in the economy of production is not complete unless the requirement for maintenance is determined. This the Missouri Station did by finding how much feed was necessary to maintain each cow at a constant body weight while dry and farrow. Other experiments have shown that a well-fed dairy cow uses about 43 per cent of her feed for maintenance, 30 per cent in the work of converting feed into milk, and about 20 per cent finally appears as milk. These percentages vary, depending on the nature of the feed and the individual, but a good dairy cow is more efficient as a machine than either the horse or the steam engine. In the Missouri experiment it was found that the higher-producing cow required slightly more feed for maintenance; hence, the wide variation in production could not be accounted for by a superiority of the high-producing cow in regard to maintenance.

During the year of the investigation, Pedro's Ramaposa produced 8,522 pounds of milk and 469.9 pounds of fat. Pedro's Elf produced 3,188 pounds of milk and 169.3 pounds of fat. The former produced 2.67 pounds of milk and 2.77 pounds of fat for each pound produced by the latter. The digestion trial showed practically identical results, the co-efficient of digestion being 64.39 per cent for the best cow and 64.99 for the poorest cow. Pedro's Ramaposa consumed 1.75 pounds of feed for each pound used by the other cow, and the real cause of the difference in production was found to be the amount of feed consumed above maintenance. The maintenance requirement being practically the same, Ramaposa had 65 per cent of the total feed consumed available for milk production, and Elf had only 44.2 per cent thus available.

It was observed that Ramaposa, when producing the maximum milk yield, was practically to the limit of her capacity for handling feed. Her maximum capacity for feed seemed to coincide closely with the amount necessary to maintain her at uniform weight. Elf consumed all her feed, and would have taken slightly more had it

been offered, although she never showed lack of feed. *Ramaposa* had much the stronger appetite; she ate rapidly, swallowed the grain with much less chewing, and always showed by her impatience to get her feed a much keener appetite than did the latter. Both cows remained in excellent physical condition throughout the investigation.

After deducting the maintenance requirement, one cow produced milk as economically as the other. The ratio between the feed available for milk production and the milk produced was practically the same for each cow. The experiment showed that cows vary but little in the maintenance requirement, or in their ability to digest feed. A superior dairy cow is one with a large capacity for feed above maintenance, and one that is not disposed to take on fat, but uses the feed above maintenance for milk production. This once more emphasizes the importance of a large, well-developed barrel and its significance in judging dairy cows, provided the cow also has a high degree of dairy temperament as shown by her lean appearance when heavily fed while in milk.

Effect of feed on quantity and composition of milk.—The general statement may be made that the quantity of milk is dependent upon the amount of feed and upon the inherent milk-giving qualities of the cow. Feed has an effect on the quantity of the milk yield, in that an underfed cow cannot produce to the limit of her ability. As shown in the Missouri experiment, however, heavy feeding does not increase the cow's ability, it merely makes possible a production that is up to the limit of her natural, inherited ability. The composition of the milk cannot be permanently changed by any known method of feeding; the composition is regulated by the udder of the cow, each cow having her own characteristic quality of milk. By fattening dry cows, the fat content of the milk is temporarily raised when the cows freshen. It is known that cows fed cottonseed meal yield butter that is hard and tallowy, with a high melting point, while linseed meal produces a soft butter with a low melting point. In spite of these and other minor exceptions, it may be said that improvement in the composition of milk is a breeding, rather than a feeding, problem. The feeder can only supply feed in such amount as will permit the cow to give a maximum flow of milk. But as we have seen, two cows may produce far different quantities of milk when given the best of care, so that increase in the quantity of milk is also a problem for the breeder. Cows are born with certain inherent abilities; feeding can assist these inherent abilities to reveal themselves, but cannot permanently alter

them. Great cows are born great. Their greatness will not be realized, however, unless they are given good care and plenty of the right kind of feed to use in manufacturing milk. No matter how large and efficient a factory may be, it cannot turn out much product unless it has available an abundant supply of the raw material, but an abundant supply of raw material will not raise the output of a poorly equipped or inefficient plant above a certain low maximum. It is far more correct to say that a well-fed dairy cow eats because she gives milk, than it is to say that she gives milk because she eats.

CHAPTER XIII

BREEDING FOR MILK PRODUCTION

There were 21,820,000 milk cows on farms in the United States on January 1, 1929, according to the estimate of the U. S. Department of Agriculture, and they were valued at \$84.59 per head. If put in single file, allowing ten feet of space for each animal, they would make a line over 41,000 miles long, or would form a procession 16 abreast from New York to San Francisco.

The distribution of dairy cattle in the United States is shown by the numbers of milk cows in the leading states and in the various geographical divisions:

Leading states in numbers of milk cows on farms, January 1, 1929

State	Number	Average value	State	Number	Average value
1. Wisconsin ..	1,935,000	\$97	6. Illinois	949,000	\$89
2. Minnesota ..	1,483,000	85	7. Ohio	908,000	93
3. New York ..	1,330,000	124	8. Pennsylvania	855,000	111
4. Iowa	1,314,000	86	9. Michigan ...	841,000	99
5. Texas	955,000	61	10. Missouri ...	810,000	74

Distribution of milk cows on farms by geographical divisions, January 1, 1929

Division	Number
North Atlantic	3,071,000
South Atlantic	1,681,000
North Central, East of Mississippi River.....	5,326,000
North Central, West of Mississippi River.....	5,898,000
South Central	3,839,000
Far Western	2,005,000

Total, United States21,820,000

Dairy cattle are densely distributed in the northern third of the eastern half of the United States, forming a well-marked belt from the eastern boundary of the Dakotas to the Atlantic, and including the northern and eastern margins of the corn belt. The concentration of dairy cattle in this region is due chiefly to the number of large cities located within it and to the large percentage of total population which it includes.

Production and consumption of dairy products.—The United States is the largest producer of milk, butter, and cheese in the world, but does not rank high in average per capita consumption. Sweden consumes about 69.7 gallons of whole milk per capita, Denmark 68.5 gallons, Switzerland 67 gallons, Germany 61 gallons, United States 55.3 gallons, Belgium 47.3 gallons, Netherlands 39.5

gallons, and Canada 27.3 gallons. In butter consumption Canada leads with 26.56 pounds per capita, and the United States with 17.8 pounds is fifth. The United States ranks only tenth in per capita consumption of cheese with an annual consumption of 4.3 pounds, while Switzerland leads with 23.3 pounds.¹

Conditions suitable to dairy farming.—Dairying is especially adapted to regions where the land is improved and productive of good crops of grain and roughage, and where the labor necessary for the continuous care of dairy cows is available. Dairy cows require more labor than any other class of farm animals. Feed and labor are both large items of expense in dairying, and the demand for them is constant, whereas in the production of meat animals the demands for feed and labor are to a greater degree seasonal.

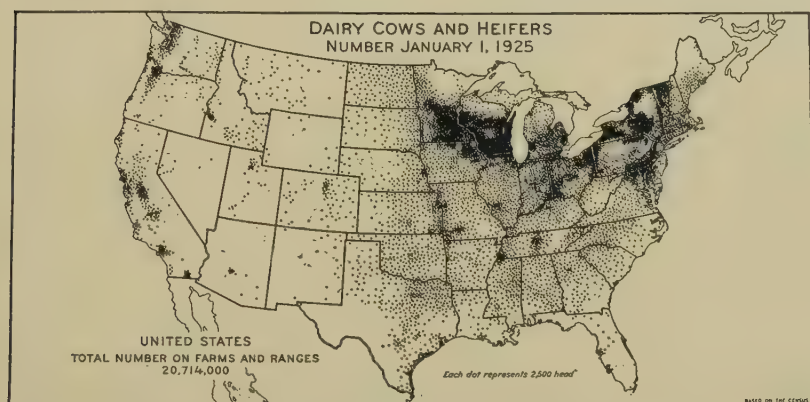


FIG. 70.—Distribution of dairy cattle in the United States. Each dot represents 2,500 head.

Economy requires that as much of the feed as possible shall be produced on the farm. The dairy cow is well adapted to high-priced lands and to diversified and intensive farming in which the farmer strives to produce the largest possible return from a limited or relatively small acreage. Dairy farming rightly practiced under favorable conditions is very profitable.

Dairying for the production of butter and cheese is successfully practiced in regions far remote from markets and consuming centers, but the production of market milk necessitates ready access to markets.

Success in breeding dairy cattle.—No greater strides have been made in animal breeding during recent years than have been made

¹ T. R. Pirtle: A Handbook of Dairy Statistics, U. S. Dept. Agr., 1928.

by many breeders of purebred dairy cattle. These breeders keep accurate records of the amount of milk and butter-fat produced by each cow. Such records not only reveal the producing ability of each cow, but they also enable the breeder to determine which bulls sire the best daughters and which cows produce the best daughters. The calves produced by the best sires and dams are retained for use in improving the herd. The calves sold from the herd are priced largely according to the records of their dams and grandams, and according to the known or proven ability of their sires and grand-sires. Marked improvement in purebred dairy cattle has resulted from keeping accurate records of production.

Many dairymen owning grade herds and engaged in the production of market milk and butter-fat have observed the benefits derived from keeping records and have adopted the methods of progressive breeders of purebred dairy cattle as the means of improving their own herds.

Success in dairying requires (1) the use of good, purebred dairy bulls and (2) the keeping of accurate records of the milk and butter-fat produced and of the feed consumed by each cow in the herd. Dairymen who are members of cow-testing associations have these records kept for them at small expense, and the cooperative bull association enables even the smallest dairyman to breed his cows to good, purebred sires.

A **dairy herd-improvement association** is a farmers' organization which employs a tester who visits each farm once a month, weighs, samples, and tests the milk of each cow, and weighs her feed. He then computes the monthly milk and butter-fat production and cost of feed for each cow in the herd. Monthly records computed in this way have been found to be very closely accurate. Such records are valuable not only for weeding out unprofitable cows, but they establish beyond all doubt the value of the herd sires by disclosing the ability of the daughters in comparison to the ability of their dams. The first cow-testing association in the United States was the Newaygo County (Michigan) Association, organized in 1905. On January 1, 1930, there were 1,143 such associations active in 47 states, including a total of 27,888 herds and 507,549 cows. Wisconsin was in the lead with 142 associations, including 3,631 herds and 63,307 cows.¹

A **cooperative bull association** is an organization of farmers for the joint ownership, use, and exchange of good purebred bulls. Such organizations accomplish two important purposes: 1. Good

¹ U. S. Dept. Agr., Bur. Dairy Indus., Directory of Herd Improvement Associations in the United States, Active January 1, 1930.

purebred bulls are made readily available to the small dairyman at small cost. 2. The good purebred dairy sire is kept in service in the community and is used to his full capacity. Too frequently good bulls are sent to the butcher because they cannot be used more than two or three years in small herds without mating them with their daughters, but a bull association puts a stop to this practice. The cooperative bull association usually has its membership divided into three or more blocks, each block being supplied with one bull which is kept two years and then shifted to another block. The bulls are owned by the association as a whole. The purchase price and cost of maintenance are distributed according to the number of cows owned by each member. By combining the cow-testing association and the bull association, members of the latter may not only own good bulls, but they may determine the actual ability of these bulls and may keep a high-class sire in use to his full capacity as long as he is serviceable.

The first cooperative bull association was organized by the Michigan Agricultural College in 1908. On January 1, 1930, there were 296 active associations in 26 states, with a total membership of 6,930, owning 1,280 purebred bulls. The 6,930 members owned 44,578 cows. There was an average of 6.7 cows per member, 5.4 members per bull, and 23.4 members per association.¹ These averages show that it is the small dairyman who benefits most from such an organization. As one writer states,² "Fifty dollars may buy a scrub bull, but if five farmers will join an association and pay \$50 each, they may own a \$250 bull."

Louisiana with 75 associations and 1,545 members had the most bull associations and the largest membership in 1930. When questioned regarding the value of cooperative bull associations, 150 farmers in Maryland, Michigan, and Minnesota estimated that the use of the association bulls increased the value of the offspring from the first cross from 30 to 80 per cent, with an average of 65 per cent.³

Results obtained in grading.—There is great need for the improvement of the average dairy cow of the country. The small number of purebred dairy cows makes it inadvisable to recommend that this improvement shall be accomplished by replacing the average cow with a purebred cow, and that all milk and butter-fat shall

¹U. S. Dept. Agr. Bur. Dairy Indus., Directory of Cooperative Bull Associations in the United States, Active January 1, 1930.

²J. C. McDowell: Butter-fat and Income, U. S. Dept. Agr. Yearbook, 1917, p. 360.

³J. G. Winkjer: Cooperative Bull Associations, U. S. Dept. Agr. Farmers' Bul. 993, p. 6.

be produced by purebred cattle.¹ However, this ideal is easily possible of close approximation by using purebred dairy bulls to grade up the ordinary dairy cows of the country. There is no good argument in behalf of keeping any except a purebred dairy bull at the head of any dairy herd. No progressive dairyman will take chances in raising a heifer calf for milk purposes whose sire is either a beef bull or a mongrel. The necessity for using purebred sires to breed to common cows and the financial advantage of such a policy was pointed out in Chapter IX, in which the breeding of beef cattle for the market was discussed. The arguments there presented apply with equal force to the breeding of dairy cattle.

Tests which strikingly illustrate the effect of a purebred sire in improving a herd of scrub dairy cows have been conducted at the Iowa Station² by Kildee, McCandlish, Weaver, and Matthews. The scrub cows were mated with good purebred Holstein, Guernsey, and Jersey bulls, and the daughters were in turn mated with similar bulls. The results presented in the following table show the average yearly production of the original scrub cows and the greatly increased ability of their daughters and granddaughters. All were fed and cared for alike, and no animals were weeded out during the experiment, so that the improvement secured can be credited only to the use of good purebred sires:

Average production by scrub cows and by their daughters and granddaughters sired by purebred dairy bulls

	Milk Pounds	Fat Pounds	Increase over original scrub cows	
			Milk Per cent	Fat Per cent
Scrub dams	3,660	172	...	...
Daughters	5,999	261	64	52
Granddaughters	8,402	358	130	109

The half-blood daughters, carrying 50 per cent of improved breeding, showed an increase of 52 per cent in butter-fat production as compared to their scrub dams. The granddaughters, carrying 75 per cent of improved breeding, showed an increase of 109 per cent in butter-fat production as compared to their scrub grandams.

¹ About 3 per cent of the dairy cattle of the United States are purebred and registered. The ten leading states in numbers of registered dairy cattle as shown by the 1920 census, in order of rank, were New York, Wisconsin, Pennsylvania, Ohio, Michigan, Illinois, Minnesota, Vermont, Texas, and Indiana. New York with over 150,000 head had one-sixth of the registered dairy cattle of the country, and Wisconsin with 115,000 had one-eighth.

² Iowa Buls. 165, 188, 251.

Scrub cow No. 56. Average yearly production 3,874.6 pounds of milk and 192.62 pounds of fat.



Half - blood Holstein No. 77, out of scrub No. 56. Average yearly production 6,955.5 pounds of milk and 266.25 pounds of fat.



Three - quarter - blood Holstein No. 233, out of half-blood Holstein No. 77. Average yearly production 12,804.2 pounds of milk and 482.54 pounds of fat.



FIG. 71.—What good purebred sires can do. Improved production in two generations through the use of purebred Holstein sires. From the Iowa experiment.

In other words, the production of this herd was doubled in two generations through the use of good dairy sires.

J. C. McDowell of the Dairy Division, U. S. Department of Agriculture, states:¹ "A scrub cow is almost worthless because she yields no profit. A scrub bull is worse than worthless because he quickly drags the remainder of the herd down to his low level. In a year a scrub cow produced 146.8 pounds of butter-fat. Her daughter, sired by a scrub bull, produced 126.3 pounds of butter-fat, and the granddaughter, sired by the same scrub, produced 99.7 pounds of butter-fat. California Gretel, a Toggenburg goat, produced almost as much."

By going to the same breed each time a sire is selected, the dairyman soon acquires a herd of very high-grade cows, having only a very small percentage of scrub ancestry. Good grade dairy cows often rival their purebred cousins in production, and many have sold at prices considerably above \$200. By using purebred sires, and by weeding out the poor producers and retaining the high-producing cows and their heifer calves, an inferior herd may be revolutionized and made to yield a profit. In this way the dairyman is enabled to raise his standards higher and higher, each year eliminating from his herd those cows which fail to reach the mark. Eventually a herd is built up in which every cow returns a large profit on the feed and care invested in her during the year.

Good breeding, feeding, and management.—The following records made by the herd of Peder Pedersen and Son in the Benson Cow-Testing Association, Cedar Falls, Iowa, in three consecutive years show what may be accomplished by the use of good sires, the keeping of records, weeding out the poor cows, and by proper feeding and management:

Year	Average milk per cow	Average butter-fat per cow, lbs.	Net income per cow over cost of feed
1911	5,665 pounds	207.7	\$22.12
	Largest net income cow in herd.....		54.22
1912	7,060 pounds	251.9	53.96
	Largest net income cow in herd.....		106.30
1913	9,697.47 pounds	341.98	75.00
	Two largest net income cows, each.....		144.00

This herd was made up of grades and a few purebred Holsteins, and the number of cows remained about the same during the three years reported. At the end of the first year it was found that 40 per cent of the cows were unprofitable. They were sent to the butcher, and their places in the herd were taken by two-year-old heifers sired by a purebred sire out of common cows. At the end

¹ U. S. Dept. Agr. Yearbook, 1920, p. 410.

of the second year, 30 per cent of the cows were "weeded out" and their places taken by two-year-old grade heifers, one purebred cow, and one purebred two-year-old heifer. The end of the third year's work showed that the average milk production had been increased over 71 per cent, the butter-fat 60 per cent, and the average net profit per cow increased from \$22.12 to \$75.00, or 239 per cent.

Selection of the dairy bull.—If twenty dairy bulls are brought before a judge recognized as competent, and he is asked to pick out the bull that will sire the highest-producing cows, he will be unable to do so with any degree of certainty by studying their individualities. He may easily eliminate some of them because of lack of constitution, weak masculinity, or because they show a decided tendency towards fleshiness. Having such faults, he is reasonably certain that they will not prove sure breeders, or that their heifer calves will not develop into high producers. Having eliminated certain ones, there will probably be several bulls remaining that have no serious faults in conformation, and among these it is mere guesswork to attempt to select the most successful sire. The beef bull carries his evidence of merit upon his back, but the true value of the dairy bull can be judged only by the kind of cows in his ancestry, the kind of cows he sires, or by both. The judging of dairy bulls in the show ring is much less conducive to good results in the improvement of cattle than is the judging of beef bulls.

As a general rule, when valuing a purebred animal, more emphasis should be placed upon individuality than upon pedigree; but the dairy bull is an exception. On a basis of 100 points given to the bull's selection, it is conservative to state that 40 points should be allotted to his individuality, and 60 points to the records of performance in his pedigree. All purebred dairy bulls have pedigrees, but in many cases no records were kept of the production of their female ancestors; in such cases the pedigree has no special significance, and little importance can be attached to it. When records of performance of the ancestors are available, the bull is said to have a "pedigree with performance," and to such a pedigree much attention should be given when selecting a bull.

If the bull is matured and has been long enough in service so that he has heifers in milk, they furnish the best evidence of the bull's value as a breeder. In this connection, however, the dams of the heifers must be studied, as the seeming success of the bull may be very largely due to the excellence of the cows with which he is mated. If the dams are inferior and the heifers are good, all the more credit is due the sire.

A Wisconsin farmer who was about to sell his purebred Guernsey bull to the butcher discovered just in time that the bull was a superior sire. When the records were completed, his daughters had produced an average of 7,886 pounds of milk and 397 pounds of butter-fat, as compared to 5,968 pounds of milk and 292 pounds of butter-fat for their dams. Another Wisconsin farmer did sell his registered Holstein bull to the butcher because he could not use him further without inbreeding, only to discover his mistake later when 11 of the daughters freshened at the ages of 2 and 3 years and made yearly records averaging 15,047 pounds of milk and 571 pounds of butter-fat. Commenting on this loss of a valuable sire, J. C. McDowell points out ¹ that a cow-testing association tests the dams and daughters, and the cooperative bull association makes it possible to keep a bull until his daughters are tested. As he states, "These associations would have saved that bull."

The pedigree with performance.—Most of the trade in purebred dairy bulls is in bull calves, for only rarely will a successful bull, as shown by actual trial, be offered for sale. The best indication of the future breeding value of a dairy bull calf is furnished by the milk and butter-fat records of his dam. If any of her female offspring have records of production, these also furnish valuable evidence. Next, the records of the cows sired by his sire should be studied, if such records are available. After that, the performance of the paternal and maternal grandams should be noted, together with the performance of their female offspring. The grandsires' lists of performers should be studied also, and, if possible, similar studies should be made of the great-grandams and great-grandires. The fundamental principle underlying breeding is that "like begets like," and if the bull has a high-producing ancestry, high-producing sisters, and the other female members of his family are high producers, we are reasonably certain that he has inherited true dairy qualities of a high order which he will transmit to his offspring.

As a fine example of a pedigree with performance, the pedigree of the Guernsey bull, May King of Ingleside 12558, is herewith presented. Such a bull commands too high a price to permit using him on grade cows, and the average dairyman seeking a sire cannot expect to obtain a bull with a pedigree equal to this one, although he may be able to secure a son or grandson of such a bull at the price he can afford to pay. This son or grandson preferably should be from a tested dam with a butter-fat record of not less

¹ U. S. Dept. Agr. Yearbook, 1920, p. 410.

than 400 pounds, and she should be descended from high-producing ancestors.

A New England dairyman writing to the U. S. Bureau of Animal Industry¹ regarding his experience with a cheap, untried, purebred sire, stated that he had purchased a bull of creditable breeding on the sire's side, but out of a dam that was "just a purebred cow," with no production records. He writes, "I had a herd of grades, 30 in number, that milked from 5,000 to 8,000 pounds of milk a year and which had taken a lot of time and money to get

MAY KING OF INGLSIDE 12553

Imp. King of the May 9001, A. R. 72.			
Sire of:	Milk	Butter-fat	
Langwater Dorothy...	16099.70	781.65	
Langwater Hope...	15078.80	773.59	
Langwater Rosie...	15083.00	724.23	
Langwater Princess...	12280.50	651.19	
Lang. May Queen...	11275.70	592.84	
Langwater Daisy...	10710.30	557.55	
Lang. May Rose...	9212.50	530.06	
Langwater Felois...	9445.90	529.81	
Langwater Milkmaid...	9550.20	510.05	
Sister Sue of Lang...	10290.70	469.60	
Hayes Queen May...	7904.50	406.94	
Also sire of seven A. R. sons.			

Dolly Bloom of Langwater 15452, A. R. 674.			
Record:	12024.50 lbs. milk;	632.34 lbs. butter-fat.	
Dam of:			
Lang. Dolly Bloom...	13250.80	714.60	
Also dam of one A. R. son			

Imp. May Rose King 8336, A. R. 41.			
Sire of:	Milk	Butter-fat	
Rosa Rubra.....	14329.15	788.89	
Florham Daisy.....	14876.60	747.08	
May Rose Queen.....	12548.30	667.19	
Comely Rose.....	12861.15	641.79	
Queen of the Roses.....	12223.25	604.94	
Florham Pride.....	10860.60	591.85	
Anton's May Rose.....	10778.70	591.55	
Southern Rose.....	12774.10	583.00	
May Rose of Kent.....	10779.65	556.56	
Rutlia's May Rose.....	9701.10	556.40	
Queen of May Rose.....	11448.90	539.03	
Pride of Place.....	10035.50	531.26	
And seven other A. R. daughters.			
Also sire of nine A. R. sons.			

Imp. Itchen Daisy 3d 15630, A. R. 100.			
Record:	13636.80 lbs. milk;	714.10 lbs. butter-fat.	Sold for \$4,000.
Dam of:			
Florham Daisy.....	14876.60	748.08	
Langwater Dairymaid	13747.50	670.12	
Also dam of one A. R. son.			

Pocomoke 6075, A. R. 74.			
Sire of:			
Dolly Bloom of Lang...	12024.50	632.34	
Nelly Jay.....	9576.10	477.27	
Carrie Bell.....	7605.00	373.38	
Also sire of three A. R. sons.			

Dolly Bloom 12770, A. R. 40.			
Record:	7297.51 lbs. milk;	836.21 lbs. butter-fat	
Dam of:			
Dolly Dimple.....	18808.50	876.34	
Dolly Bloom of Lang...	12024.50	632.34	
Also dam of two A. R. sons			

Itchen Jewel 1112 E. G. H. B.			
3d prize, Bath and West, England,			1899.
2d prize, Royal Counties, 1899.			
Sire of:	Milk	Butter-fat	
Royal Rose of Easton.	9576.90	517.80	
1st at Royal Show, 1902.			

Claremont May Rose 8648 E. G. H. B.			
2d prize over Island, 1895.			
1st prize over Island, 1896-7-8.			
1st prize in England, 1897.			
1st prize at nearly all English shows of 1890-91-92.			
1st and Championship, 1902.			
1st at London Dairy Show, 1901.			
Dam of Imp. May Rose 4th—442 lbs. butter-fat.			

May Day 1132 E. G. H. B.			
1st prize Royal Counties Show, 1898.			
1st Bath and West, 1899.			
Sire of Suzerain, 3d prize Bath and West, 1900.			
H. C. Royal Counties, 1900.			
C. Royal, 1900; 2d East Kent, 1901.			
Grandsire of Melanie of Goodnestone 3d—7415.60 lbs. milk; 387.76 lbs. butter-fat.			

Daisy Gem 3341 E. G. H. B.

John R. Gentry 4655.			
Half brother to Glenwood Boy of Haddon, A. R. 8, sire of Jedetta of Pinehurst—15109.10 lbs. milk; 778.30 lbs. butter-fat.			
Also sire of 25 other A. R. daughters, and 14 A. R. sons.			

Dosia 2d 10072.

Divan 5846, A. R. 98.			
Sire of:			
Dolly Bloom.....	17297.51	836.21	
Dolly Dillon.....	11867.30	532.21	
Belle Wilson.....	8434.40	423.55	
Also sire of two A. R. sons.			

Questa 11385.			
Dam of:			
Dolly Bloom.....	17297.51	836.21	
Dolly Bloom's sister			
Ray.....	7887.20	390.96	
Also dam of two A. R. sons.			

together. I raised 22 heifers from this bull before the first one freshened. Not one of them gave 25 pounds of milk a day with the first calf. I stopped using the bull and kept the best females to freshen a second time. There was not much improvement. The bull and every one of his heifers were sold for what I could get, which was not much. By that time a number of my cows were getting old. It was a case of buy more cows to keep my herd in good numbers as well as milk. With four years lost, and I don't

¹D. S. Burch: Utility Value of Purebred Live Stock, U. S. Degt. Agr. Circ. 235, pp. 10, 11.

know how much money, I learned not to buy an animal because it is registered, but to buy an individual whose ancestors have made good, with no weak points in his breeding, and then pay the price. It's the cheapest by far in the end."

Select individuals first, then examine pedigrees.—There is danger of over-emphasizing the importance of pedigrees when breeding any kind of live stock, and this is especially true if records of tests are included in the pedigrees. Some breeders have selected and mated their animals solely upon the basis of records, without any consideration of individuality. Animal breeding is not successfully supervised when the owner decides upon matings from pedigrees spread out before him in his office or by the parlor lamp. If this is done, and individuality is neglected, defects of conformation may gain a foothold in his herd and eventually defeat his plans. For instance, two animals may be selected for mating because of the excellence of their breeding; in other words, the mating looks good on paper; but weakness of constitution may be common to both of them, and if so, it is probable that their offspring will exhibit this defect in greater degree, so as to prevent the fulfillment of the offspring's inherited tendency to high production.

Enough attempts at selecting and mating animals purely on the basis of records have met with failure to show that such procedure is very liable to wreck the herd. The breeder must refuse to be carried away by performance to the extent of buying merely a pedigree. Choose several good individuals, and then let the pedigrees be the basis for the final choice. A meritorious individual should accompany the meritorious pedigree.

Advantages of dairy farming:

1. The dairy cow is well adapted to diversified and intensive farming where the farmer strives to produce the greatest possible income from a small acreage. Striking examples of this fact are found in Holland, Denmark, and the island of Jersey.

2. If the manure is properly conserved and used, dairy farming increases soil fertility. A ton of butter removes only 64 cents' worth of plant food from the farm, while a ton of corn removes \$6.56 worth of plant food. By feeding the crops and purchased supplementary feeds to dairy cows, the land may be made more productive.

3. The dairy cow is a continuous source of revenue. The cream or milk checks come in at frequent and regular intervals.

4. Skim milk is a most excellent feed for hogs and poultry.

5. Good grade and purebred dairy cows meet with ready sale.

It is also true that the dairy cow yields about six times as much edible solids in her milk for every 100 pounds of digestible nutrients consumed as the beef steer or mutton sheep in its carcass. On this basis of comparison the dairy cow is shown to be a more economical producer of human food than is the steer, sheep, or pig.

CHAPTER XIV

DUAL-PURPOSE CATTLE

Dual-purpose cattle are all-purpose or general-purpose cattle. They occupy a position midway between the beef and the dairy types, the aim being to combine the good points of both beef and dairy cattle as nearly as possible. The dual-purpose cow, however, does not give as much milk as the dairy cow, nor does she make as much beef as the beef cow. At present the demand for dual-purpose cattle is comparatively limited, although it has been predicted that many farms will eventually adopt the dual-purpose type as the one most profitable. It is also believed that those who maintain beef breeding herds will in the future pay more attention to the milking qualities of their cows.

Perhaps no subject relating to cattle has aroused so much discussion as has the type, economic importance, and probable future of the dual-purpose cow. It has been argued that the day of general-purpose animals is past. It is said that this is a day of specialization in all things, and that better results and more profit are obtained from animals which do one thing and do it well, than are obtained from animals which do two or three things in a mediocre way. While it is true that the tendency in the live-stock world is more and more toward highly specialized types of animals, it is also true that there are good arguments in favor of a dual-purpose type of cattle. Of these arguments, the best one is that there is need of a farmer's cow; that is, a cow for the farmer who is neither a beef producer nor a dairyman, but who wants to produce enough meat and milk for his own use. Such a man wants a cow that gives a good flow of milk, and yet one that has a strong enough beef tendency to produce a calf that will feed out well and make a good carcass; in other words, this man wants a dual-purpose cow. There can be no doubting this argument and it was this demand which made the old-time Shorthorn the popular cow with farmers 50 or 60 years ago.

Another argument frequently advanced in behalf of dual-purpose cattle is that beef production on high-priced land must, in the future, come from a dual-purpose type of cattle. On western ranches where land is cheap, a calf is all the return a cow need give in order to make her profitable, but the corn-belt farmer on \$100 and \$200 land cannot conduct a business on the same basis as the

western ranchman. It is argued that a farmer on high-priced land cannot afford to keep a cow that produces calves suitable for feeding into beef unless she pays for her board, in part at least, with a fair amount of butter-fat. It is argued that he can no more afford this than he can afford to keep mutton sheep which produce lambs, but no wool. The advocates of the dual-purpose cow claim that she will be the salvation of future beef production. However this may be, changes will come gradually and it seems probable that the beef-type animal is destined to continue popular for some years to come.



FIG. 72.—The dual-purpose type. Milking Shorthorn cow, Pansy 2d, first prize winner at Carlisle, England. Imported and owned by James J. Hill, St. Paul, Minn.

The methods of management where dual-purpose herds are kept vary considerably. Sometimes the production of beef is given most attention and the milking qualities of the cows are esteemed only as a source of feed for the calves. At the other extreme are herds managed as dairy herds, the beefiness of the cows making possible a good income from choice veal calves reared on skim milk and supplemental feeds. Neither of these plans represents true dual-purpose management. The dual-purpose cow is at her best when the plan calls for the sale of milk or butter-fat and the rearing of calves to be fed and marketed as fat steers and heifers, or

sold into other hands for feeding. All of the cows may be milked, the butter-fat sold, and the skim milk fed to the calves; or half of the cows may be milked and the rest allowed to raise the calves.

It is considerable trouble to rear calves on skim milk, but it is being done with good results on many farms. The skim milk should be supplemented by oats, bran, corn meal, hay, and good pasture until weaning time, and the calf should be wintered on grain, silage, and hay. When weaned and placed on regular rations, skim-milk calves usually advance rapidly and often overtake calves reared on whole milk to such an extent that they cannot be distinguished from the latter.

Dual-purpose type.—Descriptions of the beef and dairy types having been given in detail, dual-purpose type may be described in few words by comparisons. The true dual-purpose type of animal is distinguished from the beef animal by certain well-marked differences in form and appearance. The dual-purpose animal is not so wide as the beef animal, nor so smooth, and the fleshing is not so thick. The neck is longer, the withers are not so wide and rounding, the middle is less blocky and compact, and the legs are longer. The udder receives considerable attention and should be large, of good texture, and of good shape. The dual-purpose cow should bear indications of creditable performance at the pail.

Compared with the dairy type, the dual-purpose animal shows more squareness and fullness of forequarters, more width and compactness of body, more fleshing and smoothness. The spring of rib is more pronounced, the back is wider, the withers are thicker, the shoulder is heavier fleshed and smoother, and the thigh and twist are much more heavily fleshed. Dual-purpose cows that give a generous milk flow will carry less flesh during the milking period, but when dry they take on flesh readily. Their calves have a reasonably good fleshing when fed for market, especially if sired by a beef-type bull.

When dual-purpose cattle are brought into the ring at fairs and expositions, it is readily observable that marked variations in type exist, ranging from near the dairy type to the lower limits of beef type. What is regarded as a typical dual-purpose animal by one man will not always suit another, but will be criticised as leaning too much toward the beef type or the dairy type. Some men accept a beef cow with a larger udder than usual as a typical dual-purpose animal; others have in mind a dairy cow showing more beefiness than common. In the show rings of this country much dissatisfaction has arisen over the judging of dual-purpose

cattle; some judges have apparently awarded the prizes upon the beef qualities of the animals shown, while other judges have leaned almost as much the other way. A judge at one show will select certain animals as prize winners, and at another show, with the same cattle on exhibition, an almost complete reversal will be made in the awards—hence the dissatisfaction. As time goes on, breeders are getting closer together in their ideals of a dual-purpose animal, although there can never be the uniformity of ideals which prevails among breeders of either beef or dairy cattle. This is true because beef and dairy types represent extremes, while the dual-purpose type is an average of these two, or represents the middle ground.



FIG. 73.—The dual-purpose type. Red Polled bull, Teddy's Best, 32 times a champion and a very noted sire. Owned by Jean Du Luth Farms, Duluth, Minn.

Profits from dual-purpose cattle.—In an investigation into the methods and cost of growing beef cattle in the corn-belt states, the U. S. Department of Agriculture obtained 596 records from farms in Indiana, Illinois, Minnesota, Iowa, Missouri, South Dakota, Nebraska, and Kansas.¹ Farms where cows were kept for distinctly dairy purposes or where the herds were maintained only for the production and sale of purebred animals for breeding purposes were omitted. Records were procured on 14,634 cows and 621 bulls, and on 12,591 calves produced from them, of which 2,023

¹ Cotton, Cooper, Ward, and Ray: *Methods and Cost of Growing Beef Cattle in the Corn Belt States*, U. S. Dept. Agr. Rpt. 111.

were fattened for baby beef. Six distinct practices in beef production were noted as follows:

Beef.—Farms where all the cows are kept strictly for beef (not including farms producing baby beef).

Baby beef.—Farms maintaining breeding herds for the production of high-grade calves which are fattened on the same farm and sold at from 12 to 18 months of age as baby beef.

Dual-purpose.—Farms on which all of the cows are milked, and either cream or butter-fat sold, the calves being weaned at birth and raised on skim milk.

Mixed.—Farms on which the best cows are milked, their calves being weaned at birth and fed skim milk. Calves from the other cows are allowed to run with their dams as in the beef group.

Partially milked.—Farms on which the calves are not weaned, but on which a part of the milk is drawn from the cow, the calf taking the remainder.

Double nursing.—Farms where some of the cows are milked and their calves given to other cows, the latter raising two calves each.

The cost of calves at weaning time, the cost of raising yearlings, and the profit or loss on the yearlings was determined for each of the six groups. The accompanying table, showing the various factors that make up the cost of producing a yearling and summarizing the results of the investigation, indicates the economy of dual-purpose herds as beef producers. However, as this table is studied, it is well for the reader to keep in mind the fact that no profits were allowed for the dairying practiced by the owners of the dual-purpose, mixed, partially-milked, and double-nursing herds; instead, the returns, including profits, from the sale of milk have been used to lower the cost of the calf. Results based on such a method of cost accounting are somewhat misleading. Dairying was conducted at cost, the profits being credited to beef production.

The greatest item of expense in raising a calf to weaning time, except in the dual-purpose group, was the cow charge, or net cost of keeping a cow a year. The net cost of maintaining a cow varied greatly, depending largely upon the sale of milk products from cows that were milked. It was therefore lowest in the dual-purpose group.

The cost of the calf at weaning time was lowest in the double-nursing group. While the cow charge was lowest in the dual-purpose group, the addition of the cost of feed and labor for the skim-

Calves from dual-purpose and beef herds compared in costs and profits

Item	Beef	Baby beef	Dual-purpose	Mixed	Partially milked	Double nursing
Number of farms	230	66	110	102	65	22
Average number of cows per farm ..	31.50	34.56	12.75	23.47	14.29	17.32
Average value of cows	63.83	69.50	60.01	65.02	60.04	63.75
Average value of bulls	120.81	158.80	84.02	123.33	79.45	96.03
Cost of maintaining the breeding herd:						
Gross cost of maintaining a cow ..	35.12	36.77	55.14	43.95	42.75	46.50
Credits for milk and manure	4.79	5.39	49.07	24.72	21.43	33.26
Net cost of maintaining a cow	30.33	31.38	6.07	19.23	21.32	13.24
Net cost of maintaining a bull	42.27	53.26	37.51	46.79	34.14	40.53
Calf crop:						
Percentage of cows raising calves to weaning time	84.9	90.7	83.9	87.5	90.1	92.1
Number of calves per bull	20.9	25.3	10.7	18.5	12.6	15.0
Cost of raising a calf to weaning time:						
Cow charge	35.47	34.50	7.34	22.29	23.71	14.53
Bull charge	2.26	2.29	4.02	2.91	3.35	3.02
Feed	.01	.00	9.35	4.48	.02	.26
Labor	.00	.00	2.56	1.11	.00	.01
Total cost at weaning time (6 to 8 months)	37.74	36.79	23.27	30.79	27.08	17.82
Cost of raising a yearling:						
Number of farms	190	67	99	96	57	22
Average number of calves per farm ..	24.43	30.20	10.57	18.46	11.16	14.23
Cost at weaning time	38.20	37.01	23.64	30.61	26.39	17.82
Winter-feed cost	12.32	35.02	9.93	12.01	12.21	10.24
Other charges	4.62	6.02	4.92	4.72	4.66	3.86
Gross cost	55.14	78.05	38.49	47.34	43.26	31.92
Credits for manure and pork	1.60	7.53	1.89	1.48	1.54	1.67
Net cost	53.54	70.52	36.60	45.86	41.72	30.25
Average age, months	13	15	13	13	13	13
Average weight, pounds	475-500	834	350-400	(²)	(²)	(²)
Net cost, May 1, revised due to some calves sold at weaning time	53.16	70.52	36.80	45.97	41.06	30.25
Inventorial or farm value, May 1	37.70	71.30	31.17	33.85	35.51	33.73
Loss	15.46		5.63	12.12	5.65	
Gain		.78				3.48

¹ Includes labor, equipment, interest, risk, taxes, insurance, and veterinary expense.

² Not given, but intermediate between beef and dual-purpose groups.

³ Not given, but nearly as much as in the beef group.

Figures in bold type call attention to the fact that the baby beeves were carried along to an age sufficient to finish them for market; these figures cover a longer period than in the case of the other calves.

milk calves made the cost of the calf somewhat greater than in the double-nursing group.

The cost of the calf at one year was lowest in the double-nursing group.

The calves in the dual-purpose group, although poorest in merit and value, ranked third in profit.

The calves in the double-nursing group were relatively of good quality and showed the greatest profit.

The data obtained indicate that the keeping of cattle for beef purposes alone is adapted to the more extensive types of farming, while the keeping of cattle primarily for beef purposes, but where an income is also obtained from milk products, is better adapted to the more intensive types of farming.

The averages would seem to indicate that profits from raising calves on corn-belt farms are very small. However, these facts must be taken into consideration:

1. Good returns were obtained for a large quantity of roughage which, had it not been utilized by live stock, would have been waste.

2. A home market was provided for saleable crops.

3. On many farms a large acreage suitable to pasture only was utilized.

4. Profitable employment was provided for a season of the year when labor otherwise might have been idle.

5. A return was obtained for capital invested in equipment which, in many instances, had it not been utilized by live stock, would have returned nothing.

6. When the farmer merely breaks even he has at least made 6 per cent on the money invested in the cattle business.

PART II---SHEEP

INTRODUCTION

The United States ranks as one of the principal mutton-producing and wool-growing countries of the world. The sheep industry in America dates back to early times. It has experienced more ups and downs, due to changing conditions and varying prices than has the cattle industry or the hog industry. Lamb and wool production is a profitable business and promises to continue so, not only under range conditions but also in intensive farming.

Feed and labor requirements.—F. R. Marshall, formerly in charge of sheep investigations, U. S. Bureau of Animal Industry, has pointed out that sheep are markedly different from other farm animals in their requirements for feed and labor:¹

Lamb and wool production require a smaller use of grain feeds than is required with other kinds of live-stock farming. A majority of lambs are marketed at weaning time and without having had any feed other than the milk of their dams and a slight amount of grazing. The lamb carcass requires less fat to render it suitable for the table than is necessary in any other class of meat. This fact adapts sheep raising to sections that are not adapted to the production of grains but can furnish good pasturage and forage crops. Lambs born late in the season, lambs raised by ewes which are not good milkers, and lambs raised under conditions which do not produce a good milk flow in the ewes go into the hands of feeders and consume considerable grain, but their finish is largely produced from hay and other roughages of comparatively lower value. Breeding ewes require little grain, and good fleeces are produced without the use of concentrated feeds.

Sheep have been advocated on the ground that no labor or attention is needed. It has been said that they are farm scavengers, that they will clear the farm of weeds. It is true that sheep will eat most weeds, and that farms which have a flock of sheep usually give evidence of that fact in cleaner fence rows and corners and a tidier appearance generally. It is also true that sheep raising requires comparatively little labor. It should be emphatically stated, however, that sheep will not do well unless they are given constant

¹ Sheep and Intensive Farming, U. S. Dept. Agr. Yearbook, 1917, pp. 311-320.

attention and the care necessary to maintain thrift, yet the amount of work required is by no means heavy except at lambing and shearing time.

Sheep raising, properly managed, is profitable on the corn-belt farm, while the New England states, and large areas of cut-over timber lands in Michigan, Wisconsin, and Minnesota are suitable for sheep as soon as provision is made for the production of winter feed. Many millions of acres in this country not now in farms and which are largely unfit for the plow and not suitable for grazing by other animals, will eventually return a revenue in lambs and wool. The sheep's ability to prosper on grass and roughage, with little grain, gives it first call under these conditions.

The advantages of sheep, as compared to other live stock on the farm, have been most ably presented by the late John A. Craig.¹ He calls attention to the following:

1. Compared with cattle, sheep produce more liberally in proportion to what they consume. They consume more feed in proportion to their weight, and a larger proportion of what is eaten goes into increase. However, sheep are not so well fitted as cattle to utilize large quantities of coarse roughage.

2. The form in which sheep manure is dropped and the way it is tramped into the soil insure a smaller waste than is possible under any other system of stock farming. The sheep's habit of lying upon the highest spot of the field or pasture leaves the larger part of the droppings at the place where they are most needed.

3. Sheep farming utilizes what would be otherwise waste land.

4. They convert into mutton and wool much material that cannot be utilized by other animals. This is particularly true of grain lost in stubble. Volunteer growth or aftermath too scanty for other stock is just suited to the grazing habits of sheep.

5. Sheep are the best weed destroyers. Of the numerous plants regarded as weeds, cattle and horses eat about 50 per cent, while sheep eat over 90 per cent of them.

6. The income from wool and that from the lambs and mutton come in different parts of the year, and it seldom happens that both products sell at bottom prices the same year.

7. The wool clip is easily stored with practically no waste or deterioration if it is desirable to hold for a higher price.

8. The returns come quickly. Lambs may be marketed eight months after the ewes are bred.

¹ Sheep Farming in North America, pp. 3-8.

9. The ewe's fleece usually pays for her keep. This puts the fat lamb on the market at low cost of production.

10. With good management, the increase in the flock may be safely counted at one hundred per cent.

Fine, medium, and long-wool classes of sheep.—Sheep breeders in the various countries have developed two distinct kinds of sheep—mutton sheep and wool sheep, the latter being commonly called fine-wool sheep. Mutton sheep naturally divide into two classes known as (1) long- or coarse-wool sheep, and (2) medium- or middle-wool sheep.

Fine-wool sheep produce wool that is $1\frac{1}{2}$ to 4 inches long after twelve months' growth, medium-wool fleeces vary in length of fiber from 2 to 5 inches, and the long-wool fiber measures 5 to 12 inches. The fiber of the fine-wool fleece is very fine in diameter and has a large number of waves or crimps to the inch, usually from 16 to 22. The long-wool fiber is coarse and lashy, being rather straight and hairy in appearance. The fiber of the medium-wool fleece occupies a position between the fine- and long-wool fibers, but with fewer crimps per inch than the fiber of fine-wool sheep.

The three classes are separated by other marked differences besides length and fineness of wool. Fine-wool sheep are usually of small or medium size, and have a rather narrow form, long neck, uneven top line, white face, more or less wrinkled skin, a compact fleece often dark on the exterior, poor mutton qualities, and active dispositions. Medium-wool sheep are medium to large in size, have a wide, compact, blocky, meat-producing form, straight top line, usually have brown faces, a smooth skin, a compact fleece that is light colored on the exterior, thick flesh, excellent mutton qualities, and active dispositions. Long-wool sheep are large and rather up-standing, with blocky bodies, straight lines, white face, smooth skin, shaggy light-colored fleeces hanging in long locks or curls, thick but somewhat coarse flesh, lay on much fat, and are more sluggish and indolent in their habits.

Types, classes, and breeds of sheep.—Although variations in fleece, size, form, and other points permit the division of all sheep into three groups, there are at basis only two types of sheep—*mutton type*, and *fine-wool type*. The former includes both the long- and medium-wool groups. Following is the classification of the breeds according to type, together with the number of registered purebreds of each breed in the United States on January 1, 1920, as reported by the 1920 census:

Type	Class	Breed	Number
MUTTON TYPE.....	Long wool.....	Cotswold ¹	(²)
		Lincoln	13,903
		Leicester	767
		Romey Marsh	(³)
	Medium wool.....	Shropshire	124,454
		Hampshire Down	51,813
		Oxford Down	16,601
		Dorset Horn	8,458
		Southdown	8,451
		Cheviot	3,000
FINE-WOOL TYPE...	Fine wool.....	Suffolk	805
		Tunis	(³)
		Corriedale	(³)
		Rambouillet	106,849
		Delaine Merino } American Merino }	59,920
		All other ³	68,483
Total			463,504

¹ Though not separately reported by the 1928 census, Cotswolds are the most numerous breed of long-wool sheep in the United States.

² Includes Cotswolds, Romney Marsh, Tunis, Corriedale, and other breeds.

³ Not separately reported.

All of these breeds except the Merinos, the Corriedale, and the Tunis, originated in Great Britain. The American Merino and Delaine Merino were developed in the United States, the Rambouillet in France, the Corriedale in New Zealand, and the Tunis in the province of Tunis in northern Africa.

The mutton-type sheep is chiefly valued on account of its ability to make good mutton economically, although the wool-producing ability of the mutton-type sheep constitutes an important part of its value to the farmer. Some of the best mutton-producing breeds have failed to gain much popularity mainly because of their deficiency as wool producers. It is not expected that one type of sheep will excel in both mutton and wool production, any more than one type of cattle is expected to excel in both beef and milk production, yet it is important that the mutton-type sheep grow a fleece of good density, length, weight, and quality.

The fine-wool type is mainly a wool proposition. The American Merino is of no more value for mutton than are dairy cattle for beef. The Delaine Merino and Rambouillet have better mutton qualities, though not equaling the mutton breeds in this respect, and this largely explains their greater popularity as compared to the American Merino.

Combined wool-and-mutton type most popular.—The American farmer, and likewise the rangeman, has declared that the most profitable sheep to grow in this country is, as a rule, a combined wool-and-mutton type. Among the mutton breeds, and also among

the fine-wool breeds, those which yield the most and best of both mutton and wool rank highest in popularity, while those breeds which are more highly specialized so as to be superior in one line of production and inferior in the other are not so popular. The popularity of a breed depends also upon other factors such as constitutional vigor, prolificacy, quietness of disposition, feeding qualities, grazing qualities, ease of shearing, and early maturity, but first and fundamentally the breed must produce both a good carcass and a good fleece if it is to be popular with the farmer. Every breed has its place, however, and to eliminate all except two or three breeds from American farms and ranches would be poor policy. Some of the less popular breeds are highly valued for producing rams to use in cross-breeding or grading-up to produce the desired type. Other less popular breeds have special features which give them the preference under certain special conditions of climate, feed supply, or method of management.

Definitions of Sheep Terms

Ram or buck.—Breeding male, any age.

Ewe.—The female, any age.

Lamb.—Any sheep under twelve months of age.

Wether.—Unsexed male, castrated when a young lamb. The best age to castrate lambs is from 7 to 10 days old at the same time they are docked.

Stag.—Unsexed male, castrated when mature or so far advanced toward maturity that masculinity is plainly evident in head, neck, and forequarters. This constitutes coarseness in a market animal.

Shearling.—A yearling.

Two-shear.—A two-year-old.

Two-tooth.—A yearling.

Four-tooth.—A two-year-old.

Show Yard Classification by Ages

The base date for classifying sheep by ages in September 1, and the classes by ages are as follows:

Lamb class.—Animals are eligible to this class that were dropped on or after September 1 of the preceding year.

Yearling class.—Dropped on or between September 1 of the second preceding year and August 31 of the preceding year.

Two years old and over (aged) class.—Dropped before September 1 of the second preceding year.

Champion.—Best animal any age.

Grand champion.—Best animal any age or breed.

For example, during the summer, fall, and winter show season of 1930, lambs are those animals dropped on or after September 1, 1929; yearlings, between September 1, 1928, and August 31, 1929; and aged animals two years old and over are those dropped prior to September 1, 1928.

CHAPTER XV

MUTTON TYPE

Although the breeds of sheep classed as mutton breeds may be grouped into two distinct classes—long-wooled and middle-wooled—and although the breeds within each class differ considerably in color markings, fleece, and appearance, nevertheless all of them belong to the mutton type. The following description applies particularly to sheep or lambs fattened for the market.

The **general appearance** of the mutton-type sheep is almost identical with the beef type of cattle. The mutton sheep should be markedly short legged, broad, deep, and symmetrical. The top line and underline should be straight and parallel, and the top should be broad and level from end to end. The side lines should be straight, and the middle wide and deep, yet neat and trim. Leggy and rangy conformations are as objectionable in mutton sheep as in beef cattle. There should be pronounced blockiness of conformation combined with neatness, fullness, and great smoothness of outline.

The **head** should be short and broad, the mouth of ample width, the nostrils large, the face short, the eyes prominent and clear, the forehead broad, and the ears rather fine, short, neatly attached, and well carried. The mutton type does not have horns as a rule, the Dorset breed being the only exception. The head should have a clean-cut appearance, indicative of quality and good breeding.

The **neck** should be short and plump, arched, trim at the throat, and should join the shoulders full and smooth.

The **shoulders** should be compact, smooth, and nicely covered over with flesh, making the forequarters very even and smooth. The tops of the shoulders should come fairly well together and be rounded over with flesh.

The **breast** ought to be prominent, broad, and filled out plump with flesh. A wide breast is an evidence of strong constitution, and plumpness of this part is one of the indications of proper finish and fatness in the market sheep.

The **chest** should be very wide and deep, and have a full heart-girth. There should be considerable distance between the front legs, and also between the shoulders, and no depression of the side should exist just back of the shoulder. The front flanks should carry down deep and be well filled out.

The **front legs** should be short and straight, the shanks fine,

and the joints not too large. The knees show some tendency to come together, but this should not be marked. Attention should be given to the pasterns which should carry up strong, and to the feet which should be well developed, strong, and point directly forward.

The **back** furnishes one of the valuable cuts of the carcass. It should be very wide, short, and straight, and should be thickly, firmly, and evenly fleshed. When the hand is pressed down upon the back it should exhibit no dip or weakness, but carry up level and strong. In thin sheep the backbone is marked by a sharp ridge; in well-fattened animals the back is smooth, the backbone being covered; while in very fat animals the flesh may be thickened on either

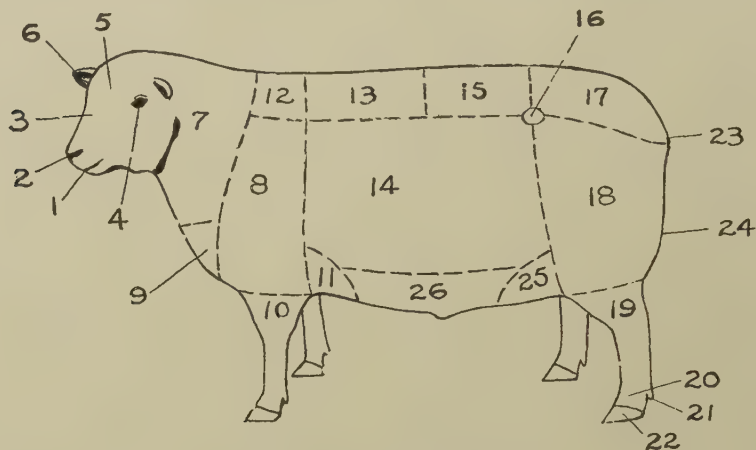


FIG. 74.—Points of the sheep.

1. Mouth	8. Shoulder	15. Loin	21. Dew claw
2. Nostril	9. Breast	16. Hip	22. Foot
3. Face	10. Fore leg	17. Rump	23. Dock
4. Eye	11. Fore flank	18. Thigh	24. Twist
5. Forehead	12. Top of shoulders	19. Hind leg	25. Hind flank
6. Ear	13. Back	20. Pastern	26. Belly
7. Neck	14. Ribs	18 and 24. Leg of mutton	

side of the middle line to such an extent that a groove is found down the middle of the back instead of a ridge.

The **ribs** must have a strong arch to give width to the back, and they should carry down deep to afford a large chest and good feeding capacity. They should be placed close together along the side, the last pair coming close to the hips. The covering of flesh on the ribs should be thick, even, and firm. The side should be straight and even, the belly should be straight and trim, and the hind flanks should be well let down.

The **loin** yields the highest priced cut of the carcass. Like the back, it should be very wide, straight, strong, and covered evenly

with thick, firm flesh. The backbone should be covered. Sheep may be well covered over the back and poorly covered over the loin, therefore careful handling all along the top is necessary in order to judge of the fleshing.

The **hips** should not be prominent; they should be well laid in and smoothly covered over with flesh.

The **rump** ought to be long, level, and wide, the top line carrying out straight to the end of the body. One of the most common faults of mutton sheep is a poorly shaped hindquarter, the rump fre-



FIG. 75.—Correct type in the wat wether. Grade Shropshire yearling wether, grand champion at the 1913 International. Bred, fitted, and shown by J. and D. J. Campbell, Woodville, Ont., Can. Neat in form, excellent in quality, and thickly and firmly fleshed. His fatness, trim middle, and good quality insure a high dressing percentage. This sheep belongs to the medium-wool class.

quently rounding off or drooping on top, and the sides cutting in to give a peaked conformation. Squareness and fullness should characterize the hindquarter. The covering of flesh should be abundant, yet smooth and free from softness or bunches of gobby fat.

The **thighs** and **twist**, often called the "leg of mutton," should be broad and plump as viewed from the rear, and the fleshing should carry well down toward the hocks, as in beef cattle. The leg of mutton, loin, and back constitute the valuable parts of the carcass, and they must carry a high degree of fleshing. Wide variations in the development of thigh and twist will be found, although a maximum development is always demanded.

The **hocks** and **hind legs** should be strong and placed well apart. When the hocks are close together, the thigh and twist usually lack a full development. Crooked, weak hocks, either badly sickled or bowed, are rather common and are very undesirable. The legs should be short and straight, and show refinement of bone and joints. The hind pasterns are also given attention in judging, for it is by no means uncommon to find them broken down and weak so as to impair the usefulness of the animal to a marked degree. They should carry up strong, so as to bring the weight full on the toes.

The **skin** should be of a bright pink color and free from dark-colored spots. The pink color is an indication of health and thrift, while a white or bluish color shows an unthrifty condition. Some breeds excel in this respect, and others characteristically show a rather dark color due to the presence of pigment in the skin, in which case the dark color is not necessarily an evidence of unthriftiness. The dark-faced breeds often have a pigmented skin over the body, and with this fault is often associated the fault of having black fibers in the fleece.

The **quality** of the mutton-type sheep is shown by the fineness of the head and bone, fineness of the wool, and fineness and softness of the hair on the face and legs. Quality is also shown by the smoothness of the animal, both in frame and in fleshing. Coarse shoulders, an angular build, and uneven flesh show lack of quality in a mutton sheep. These are important features in either breeding or fat sheep. Quality and good breeding are usually associated. Well-bred animals respond best when fed and fattened for the market. The butcher likes quality because it insures high quality of meat, and indicates little waste when the sheep is killed and dressed. A sheep of good quality yields an attractive carcass with smooth, even outlines.

The **condition**, or fatness, of a sheep may be determined by an examination of six points, these being the spinal covering, the neck, the breast, the fore flank, the dock, and the purse.¹ The first of these is by far the most important, as it insures a good finish where it is most valuable, namely in the high-priced cuts. The covering over the back and loin should be such that the top is smooth and the backbone not easily felt. The neck and breast of a well-finished sheep are plump, the fore flank is well filled, the dock is found thick when grasped in the fingers, and the purse is well filled with fat. Sheep that have been over-fed often have bunches of soft fat at the end of the rump, and a blubbery mass of fat at the fore flank. Sheep

¹ The purse is the scrotum of the wether and its content of fat, the same as the cod of the steer.

that have much loose fat at the fore flank are referred to as "slipped," it being commonly, but erroneously, supposed that this condition is due to a very heavy formation of fat along the back which becomes excessive and slips down the ribs to the fore flank. The butcher sharply discriminates against such an excessively fat condition, and the breeder has found that slipped ewes are frequently barren. The market wants a thick, firm covering. Softness indicates a "wasty" carcass. Lambs very seldom become too fat, but yearlings and older sheep may be easily fed until they become soft and overdone.



FIG. 76.—Long-wool sheep. Lincoln ram, champion at the Iowa State Fair, owned by A. W. Arnold, Galesville, Wis.

The style which some mutton sheep possess has an importance similar to style in beef cattle. Furthermore, feeders testify that the lamb or wether with stylish appearance and sprightly gait is usually vigorous and a good feeder, style being to some extent an evidence of constitutional vigor and thrift.

The fleece of the mutton-type sheep is of secondary importance, yet constitutes an important item of value. The value of the fleece depends upon its length, weight, quality, and uniformity. Weight

of fleece depends upon covering, density, length of staple, and the amount of oil, or grease, called "yolk." The quality of fleece refers in a strict sense only to fineness of fiber, but in a general way may also include softness, soundness, luster, color, cleanness, purity, and freeness.

The **covering** of wool has reference to the completeness of covering over all parts of the body. Some animals are very devoid of wool on the belly and around the flanks. The breeds differ widely in the extent to which the poll, ears, face, and legs are covered with wool, such features forming a prominent part of some breed types. The tendency in recent years, especially with some breeds, has been to secure a more complete covering of wool, and thus produce a fleece of somewhat more weight. In all breeds, the under parts of the body, including the scrotum of the ram, should be well woolled.

A **dense** fleece is one that is compact, or has a large number of fibers growing on a square inch of skin. As much density is desired as is possible to attain.

The **length** of fiber varies greatly among the mutton breeds, so that it is difficult to fix requirements for length of fleece for the mutton type in general. However, a length of less than 3 inches for a year's growth should subject a mutton-type animal to criticism, and if it is less than $2\frac{1}{2}$ inches the wool sells at a lower price per pound on the wool market, as it is then not adapted to the manufacture of worsted cloth. As a rule, the longest fleeces are the coarsest and most lacking in density; maximums of fineness, length, and density cannot be secured in one fleece. The medium-wool breeds vary in length of staple from 2 to 5 inches, while the long-wool breeds vary from 5 to 12 inches.

The **yolk** is a variable feature and a highly important one. It is an oily substance secreted by glands in the skin, and passes out over the fibers, giving them an oily coating that is valuable because it makes the wool soft, protects and preserves the fibers, and, by causing the fibers to lie even and regular, insures against matting or "cotting," of the fleece. A plentiful supply of yolk also tends to prevent the entrance of dust, chaff, and other foreign material into the fleece. Incidentally, the yolk adds weight to the wool, although an excessive amount of oil that merely adds weight to the fleece is not desirable. The yolk should be in a fluid condition and should be uniformly distributed throughout the fleece from skin to tip of fiber. It should not be so abundant as to collect in drops in the fleece, nor should any flakes of dried yolk be in evidence. The yolk is frequently referred to as the "grease" or "oil."

The **fineness** of fiber, from the earliest days of wool growing, has been esteemed one of the most important requirements of wool. It varies a great deal among the breeds of mutton sheep, and also among the individuals within a breed. It is not expected that the mutton type will produce a fiber with the high degree of fineness shown by the Merinos, yet as much fineness is wanted as may be had without sacrifice of weight or quality of fleece. The crimp, or waved condition, of wool furnishes an easy and accurate measure of fineness. All wool is more or less crimped, and it is a fact that the finest wools are finely crimped, that is, have a large number of



FIG. 77.—Correct type in the fat wether. Southdown wether lamb, grand champion at the 1928 International. Shown by the University of Kentucky. Low set, wide, compact, blocky, straight lined, and exceptional in thickness, smoothness, and firmness of flesh.

crimps per inch, while the coarsest wools are almost devoid of crimp, being lashy or broadly waved. The crimp of the medium-wool fleece should be fine, pronounced, and uniform from skin to tip of fiber. A single fleece yields several sorts of wool, differing considerably in fineness. The finest wool grows on the belly, shoulders, and back; that next in fineness, on the neck, breast, and along the sides, while the coarsest wool is found on the thighs and lower parts of the legs.

Wool that has **softness**, yet is firm and elastic, is far more valuable than that which is dry, stiff, and harsh. On the other hand, mushy wool having a soft, lifeless feel with no recoil when handled is very often lacking in strength. Softness depends upon fineness of fiber and amount of yolk. Ill health, exposure to rough weather, or lack of feed results in loss of softness.

The **soundness** of wool refers to its freedom from weak spots. Sickness, a sudden shock from a blizzard, lack of feed, a rapid change from green to dry feed, or the reverse, and over-feeding often cause the secretion of wool to be lessened for a time, thus producing tender wool. Under the microscope the fibers are found to



FIG. 78.—The mutton type. Note the wide breasts, short legs, short necks, and nicely proportioned heads of these Southdown yearling ewes.

be narrow in those parts produced under adverse conditions. Yarn made from such wool will be lacking in strength. Sickness will often cause a distinct break in the fiber throughout the fleece. (See Fig. 120.)

Wool is said to have **luster** when the fibers glisten as though thinly varnished. This feature is especially prized in long-wooled sheep. A luster wool takes a dye more readily than does a dull, or lusterless, wool. Furthermore, the luster is plainly apparent in the finished cloth, improving its appearance.

The **color** of the wool fiber should be a clear white. The occurrence of brown or black fibers mixed in the fleece subjects the animal to much criticism. Such wools cannot be used in the manufacture of white goods or those of light shades. Unless the fiber

has perfect whiteness, a rich, brilliant dye cannot be secured by the manufacturer.

As regards cleanness, all sorts and conditions of fleeces are found, ranging from those above criticism, to those that are a mass of burs, sand, bits of straw, manure, and other rubbish—the whole fleece being matted together and constituting a product of no commercial value. Cleanness depends mostly upon the conditions under which the sheep are kept, although some fleeces, on account of their



FIG. 79.—Determining the age of sheep from the teeth. Upper left, lamb; all the teeth being temporary or milk teeth. Lower left, yearling; center pair of temporary incisors replaced by larger permanent incisors. Upper right, two-year-old; two pairs of permanent incisors. Lower right, four-year-old; four pairs of permanent incisors. The lamb and yearling were photographed directly from in front. The two-year-old and four-year-old were photographed to show the side of the mouth. The photographs were not made to the same scale.

oiliness and density, tend to keep free from foreign material, while others, on account of their open, dry, fluffy character, offer no resistance to the entrance of foreign matter.

By **purity** of fleece is meant its freedom from hair, called "kemp," and from dead fibers. With unfavorable conditions of keep and inferior breeding there is often a reversion of the fleece to the covering worn by early sheep; that is, hair begins to appear in place of wool. Dead fibers and kemp do not absorb dyes, hence they injure the cloths into which they find their way.

The fleece is said to have **freeness** when the locks and fibers are not entangled, but part off readily from one another. When the fibers are tangled, or matted together, the fleece is said to be "cotted."

A fleece with **uniformity** is one having sameness in character throughout. Although there is a natural tendency for the wool on different parts to vary in density, length, and fineness, the aim of the breeder is to produce a fleece as nearly uniform throughout as possible.

Age from the teeth.—The teeth are a fairly reliable indication of the age of a sheep. The lamb has eight temporary incisors, or milk teeth, in the lower jaw. There are no incisors in the upper jaw. At 14 months of age, the middle pair of milk teeth is supplanted by a pair of larger, permanent incisors. At 2 years, the second pair of permanent incisors appears; at 3 years, there are three pairs; and at 4 years, all eight permanent incisors are in place. At five years, the teeth show more width between, and at six, the corner teeth may be broken out or the mouth may show signs of wear. Broken-mouthed sheep have their usefulness much impaired, and should not be kept unless for special purposes. (See Fig. 79.)

CHAPTER XVI

THE MUTTON CARCASS AND THE PELT

Mutton and lamb supply a wealthier class of consumers than beef, pork, or veal. Lamb is ordinarily considered something of a delicacy, while beef and pork are looked upon as staple articles of food. The proper handling of mutton and lamb necessitates more careful and quick slaughtering than is required in the case of beef or pork, and good refrigeration facilities are also very essential. The public taste for mutton and lamb was not created until the development of the refrigerator car nor until the erection of large-scale chill rooms was made possible by artificial refrigeration. The year 1875 marked the advent of these great aids to the packing business. Mutton differs from pork and beef in that it is almost entirely a fresh meat product and does not lend itself to salting, pickling, smoking, or drying as do pork and beef. Hence mutton became a world commodity only after the development of artificial refrigeration and refrigerated transportation. Still another reason for the comparatively recent demand for mutton and lamb is found in the fact that, up to 1870, the great majority of all sheep in America were either purebred or grade Merinos. Good mutton became plentiful only after the use of mutton rams became general on farms and ranges. Lamb is usually superior to mature mutton in flavor and general palatability, and the demand for lamb far exceeds the demand for mutton; the wholesale trade consists of two or three times as much lamb as mutton.

Slaughtering.—Sheep purchased by packers are driven to the packing plant and allowed to rest a few hours, because animals killed while in an excited condition or immediately after exercise do not bleed out thoroughly. They are then driven into a small shackling pen, and a shackle is placed around the hind leg. Two at a time, the sheep are raised by a large revolving wheel to a point overhead where the shackle automatically unhooks from the wheel and starts down a gently inclined rail. The animal moves to the “sticker,” who quickly dispatches the sheep by a single thrust of a double-edged knife. Briefly, the operations consist of bleeding, and removal of pelt, feet, head, windpipe, gullet, and all internal organs except the kidneys. After passing through many hands, the carcass reaches the cooler, the dressing requiring about half an hour.

Method of dressing.—Prior to the World War, a number of styles of dressing sheep and lambs were used, but during the period of the war, as a conservation measure, the U. S. Food Administration instructed all packers that sheep and lambs must be dressed by the plain or round method, and without caul or pluck. This method of dressing, which is the most economical, has been continued since the war to the present time, and there is no indication that the other styles of dressing will be practiced in the future. Plain or round-dressed sheep and lambs have the pelt, head, and feet removed, and the fore legs are folded at the knees. They are opened from the cod or bag to the breast, and are split through the breastbone. A spread stick is placed in the breast to hold it open and properly shape the carcass.



FIG. 80.—Killing sheep at Chicago.

Formerly, in dressing the lowest grades of mutton and most lambs, the caul (a fatty membrane investing the internal organs) was wrapped about the legs and laid over the inside of the carcass, thus improving the appearance, preventing drying out, and, in some cases, furnishing the fat necessary for proper cooking of the meat. The caul contains considerable fat, and as it was usually discarded by the retailers of mutton and lamb, the Food Administration rightly designated this style of dressing as wasteful and caused it to be discontinued. Cauls are now sent to the rendering tank for the extraction of fats and oils. The pluck consists of the heart, lungs, liver, windpipe, a portion of the diaphragm, or "skirt," and more or less adhering fat. Formerly, most lambs were sold "pluck

in," and sheep were usually sold "pluck out." The pluck is now used principally in the manufacture of different kinds of sausage.

The offal.—In the plain or round-dressed style of dressing, the sheep loses the following parts in the order named: blood, pelt, feet, head, and viscera. The pelt is the skin with the wool on, and it is a valuable by-product.

The dressing percentage.—From what has been said of slaughtering and dressing, it is apparent that in order to dress a high percentage of carcass, sheep must be (1) heavily fleshed, fatness being especially important, though the amount of lean meat or muscle is also an important factor; (2) neat in form, or free from paunchiness; and (3) light in pelt. The dressing percentage of sheep is not so important as that of cattle, because the offal has a higher value than the offal from cattle, on account of the high value of the pelt. If a sheep is fat in condition, and neat and trim in form, it will tend to dress high, but the fleece should be as heavy as is consistent with the production of mutton of high quality. As a general rule, the choicest sheep and lambs, from a carcass standpoint, do not wear heavy fleeces, although a heavy fleece in itself is valuable, as will be shown later, and between two sheep otherwise equal, the one with the heavier fleece will bring the higher price on the market, even though its heavier pelt lessens its dressing percentage to some extent. Sheep and lambs range in dressing percentage from 40 to 65 per cent, but ordinarily dress from 45 to 55 per cent. Mutton carcasses usually weigh from 45 to 85 pounds, while most lamb carcasses weigh from 35 to 50 pounds.

Qualifications of a good carcass.—The value of the carcass depends chiefly upon (1) form, (2) covering, (3) quality, (4) weight, and (5) maturity. Each of these factors is briefly discussed.¹

1. Form.—The essential points of desired shape are good width in proportion to length, compactness, and smooth, even outlines. This implies a thick loin; broad back; well-fleshed ribs; a full, thick middle from shoulder to leg; plump, thick legs filled down well; and smoothly covered shoulders. The most common faults of form are long, slender legs, narrow backs, lack of development over ribs and loin, and too much paunch, or belly. Long necks in ewes, and heavy "bucky" necks, shoulders, and briskets in wethers are objectionable.

2. Covering.—It is essential that the carcass be smoothly and evenly covered with fat, because of its influence on the appear-

¹ For these discussions the writer is indebted to Illinois Bulletin 147, *Market Classes and Grades of Meat*, by Louis D. Hall.

ance of the dressed sheep, the quality of meat, and the shrinkage both in storage and in cooking. Only in the most highly finished sheep are the legs and shanks completely covered. The kidney fat should be well developed, but not excessive. A light kidney usually indicates lack of finish, while a very heavy one is evidence of overdone condition or uneven distribution of fat. The purse, udder, rump, flanks, and brisket are other points at which the amount of fat is plainly apparent, but it should not be excessive on any of these parts. The lowest grades have practically no outside fat, the amount of covering varying more or less directly with the



FIG. 81.—Lamb carcasses. Beginning at the left, the grades represented are choice, good, medium, and common.

grades of mutton from common to choice. The external and kidney fat should be firm, brittle, and white. As with beef, the English consumer desires fatter mutton than would suit the American trade.

3. Quality.—The term “quality” is here used somewhat broadly, to include not only refinement of bone and fineness of texture of flesh, but also color of lean and fat. The flesh should be firm and fine grained, without the stringy, coarse texture of aged

or inferior mutton. The color of flesh varies from light pink in lambs to dull red in mature mutton, and is less variable than in beef. The fat should be clear and white. General quality is more important in mutton and lamb than in other branches of the meat trade, on account of the custom of using the carcasses for display purposes in retail markets.

4. **Weight.**—This is of more importance in grading mutton than in grading beef, as it is often a strong indication as to whether a carcass is a lamb, yearling, or mature sheep. The extreme ranges in weights of carcasses are, lambs, 15 to 50 pounds; yearlings, 40 to 60 pounds; wethers, 40 to 120 pounds; bucks, 45 to 200 pounds; ewes, 50 to 200 pounds. The most desired weights for a lamb carcass are 40 to 45 pounds; for mutton carcasses, 50 to 65-pound



FIG. 82.—Break-joints and round-joint. In dressing mature sheep, the feet are taken off at the ankle, leaving a round-joint on the end of the shank bone. Immediately above the ankle in immature stock is a temporary joint, called the break-joint, at which the feet are removed. Thus the head of the shank bone as well as the foot is removed, leaving the saw-toothed break-joint on the end of the shank bone. As the animal matures, the break-joint ossifies or knits. Pincers are sometimes used to crush off those which are partly ossified. This leaves an imperfect break-joint. The shank bones of mature sheep will not break. At the left above is a true break-joint, at the right a round-joint, and in the center a crushed break-joint from a nearly mature sheep.

weights are most desired. As with beef, heavy carcasses are demanded by hotels, restaurants, and dining cars.

5. **Maturity.**—As has been mentioned, the demand for lamb far exceeds the demand for mutton, and the price of lamb is considerably higher. The packers' interpretation of the word "lamb" is broader than the ordinary understanding of the term, for both lambs and yearlings yield a "lamb" carcass. Mutton carcasses are those of wethers two years old or over, ewes, bucks, and stags. The

maturity of the carcass may be easily determined with a fair degree of accuracy from the bones; in lambs the brisket is soft and red, and the ribs and shank bones are colored by blood vessels; in mature sheep the bones are white and hard. However, the *break-joint* furnishes the best means of distinguishing lambs and yearlings from mature sheep. The break-joint or lamb-joint is a temporary cartilage which forms in the head of the shank (shin bone) immediately above the ankle. In dressing lambs, yearling wethers, and some yearling ewes, the foot can be broken off at this cartilage, giving the end of the shank a saw-tooth shape. In lambs the broken surface is smooth and moist, and in yearlings it is more porous and dry. The shanks of mature sheep will not "break," because the cartilage is knit or ossified, and the foot is taken off at the ankle instead, making a "round-joint." Shanks of female or ewe sheep outside the lamb class are, as a rule, too mature to break. Consequently, 80 to 90 per cent of "yearling lamb" carcasses are wethers, the remainder being ewes and a small proportion of bucks and stags. Yearlings substitute for genuine lamb, and we see that they may easily do this because they possess the break-joint. (See Fig. 82.)

Goat carcasses.—Dressed goats are occasionally sold in connection with mutton and lambs, and are frequently substituted for them, especially in the retail markets. They are similar to the lowest grades of western sheep in form, quality, and finish. Long shanks, coarse, dark flesh, long necks, and thin caul, however, render them quite easily distinguished from sheep carcasses.

Carcass classes and grades.—Carcasses of sheep and lambs are classified and graded as follows:

	Class	Grade
LAMB.....	{ Lambs	Prime, choice, good, medium, common
	{ Yearlings	Prime, choice, good, medium, common
MUTTON....	{ Wethers	Prime, choice, good, medium, common
	{ Ewes	Choice, good, medium, common, canners
	{ Bucks	Good, medium, common

The following wholesale prices¹ indicate the comparative values of the above classes:

Class and grade	Weight	Price per pound
Special Selected Lambs.....	.35 to 45 lbs.....	25 cents
Good Lambs.....	.35 to 45 lbs.....	23 cents
Medium Lambs.....	.35 to 45 lbs.....	22 cents
Common Lambs.....	.25 lbs.....	18 cents
Yearling Lambs.....	.40 to 45 lbs.....	16 cents
Wether Sheep.....	.45 to 55 lbs.....	14 cents
Ewe Sheep.....	.45 to 60 lbs.....	12 cents
Common Sheep.....	.....	10 cents

¹ Wholesale price list of a leading Chicago packer, March, 1923.

Differences due to age and sex.—Carcasses of lambs and yearlings differ from other carcasses in that they show the break-joint on the fore leg. Yearling carcasses differ from lamb carcasses in showing more maturity and usually more weight. Lamb carcasses show lighter colored and finer-grained flesh, redder and softer bones, and a smoother and moister break-joint than yearlings. Carcasses of wethers, ewes, and bucks are similar in showing the round-joint on the fore leg, but wether carcasses may be distinguished by the cod fat, ewes by their udders, and bucks by their coarse, heavy necks and shoulders. The wether carcass is more compact and thicker fleshed than the ewe carcass. Ewes are more angular and have longer necks, smaller bone, and less thickness of flesh. The buck carcass is coarse and dark colored in its flesh, and has a thick, oily "fell" (the white membrane covering the carcass). Many stags and some bucks closely resemble wethers and are commonly sold as such.

The wholesale cuts.—The following diagram represents a side view of a carcass of lamb or mutton, the dotted lines indicating the division into wholesale cuts.

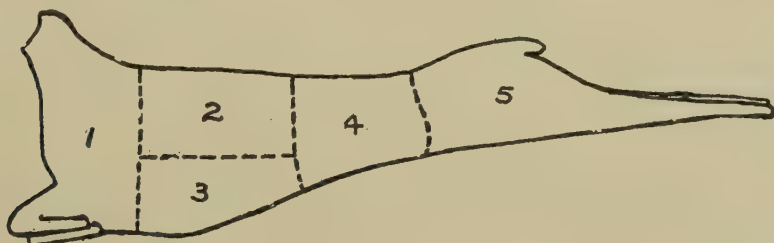


FIG. 83.—Wholesale cuts of mutton. 1, Chuck; 2 short rack; 3 breast; 4, loin; 5, leg; 1 and 3, stew; 1, 2, and 3, rack; 4 and 5, saddle. The chuck may be divided into neck, shoulder, and shanks.

The leg and loin together are called the saddle, and the combined short rack, chuck, and breast are called the rack. The saddle and rack are almost equal in weight. One rib is left on the loin. The short rack includes from 9 to 11 pairs of ribs, depending on how the carcass is divided between short rack and chuck. The chuck and breast are usually sold together as one cut, called the "stew." In average 45-pound carcasses of lamb and mutton, round dressed, and pluck out, the weights of the various wholesale cuts, their wholesale prices per pound, and total values are as given in the following table:

Weights, prices, and values of wholesale cuts of mutton and lamb

Wholesale cuts	Weights in pounds	Weights in per cent	Price per pound		Total value of cut	
			Lamb	Mutton	Lamb	Mutton
Leg	13.7	30.5	31	26	\$4.25	\$3.56
Loin	9.6	21.3	33	18	3.17	1.73
Short rack (10 ribs)	6.4	14.2	32	19	2.05	1.22
Stew	15.3	34.0	13	12	1.99	1.84
Saddle	23.3	51.8	31.8	22.7	7.42	5.29
Rack	21.7	48.2	18.6	14.1	4.04	3.06
Totals	45.0	100.0	25.5	18.5	11.46	8.35

High-priced and low-priced cuts.—The average price for the entire lamb carcass is 25.5 cents per pound, while the mutton carcass averages 18.5 cents per pound. As in the beef carcass, the loin, back, and hindquarter yield high-priced cuts, while the forequarter and belly, constituting the chuck and breast cuts are low in price because they lack thickness, the quantity of flesh elements being relatively small. The leg and loin of the lamb include 52 per cent of the carcass weight and 65 per cent of the total value; and the leg, loin, and short rack include 66 per cent of the weight and 83 per cent of the value.

Packing House By-Products from Sheep

A greater proportion of the sheep's value to the packer lies in its by-products than is true of the steer or the hog. Edward N. Wentworth of Armour's Livestock Bureau states ¹ that for the half year ending June 30, 1930, the average value of the meat yielded by the sheep slaughtered at nine of Armour and Company's plants was \$8.79 per head, the average return from the pelts was \$1.43, and the value of all other by-products was 47 cents. Expressed in percentages, the carcass represented 82.2 per cent of the total value, the pelt 13.4 per cent, and all other by-products 4.4 per cent.

The value of the pelt.—Information has been given out from various sources that buyers of sheep for the packers prefer animals wearing light pelts. It has been said that the slaughtering departments of packing houses without exception dispose of sheep pelts at a fixed price per pelt, consigning them to the wool-pullery department of their own plant, or to some independent pullery. Buyers have been reported to prefer light-wooled lots in order to obtain high dressing percentages; it has been said that buyers have no

¹ Information to the author.

particular interest in the welfare of their own pulleries, or in other firms that buy the pelts for pulling. Farmers have been advised that the highest market price is obtained for sheep and lambs that are light in pelt and which consequently dress high.

Can it be possible that the packer, with all his genius for the utilization of by-products, is overlooking such an important item as wool? If the shank bones of cattle may be profitably converted into buttons and other articles, is it not inconsistent and unbusinesslike to discount well-wooled lots of sheep? With wool worth 25 to 50 cents per pound, is it not strange that the buyer should refuse to bid higher on a well-wooled band of sheep than upon a lot with light fleeces, other things being equal, especially as the fleece is obtained at the live-weight price of the animal, namely 10 to 20 cents per pound? In handling thousands of sheep, the wool reaches a considerable valuation. If light pelts are wanted, why do shorn sheep sell at a discount?

Such questions as these led the writer to make an investigation which included interviews with the principal buyers at Chicago, and an inspection of a modern wool-pulling establishment owned by one of the packing firms. It was found that a few buyers do give preference to light-pelted lots, but that class of buyers is decidedly in the minority. Swift, Armour, Wilson, and New York butchers have for some time realized the added value of a heavy fleece, and this has enabled them, in many instances, to outbid competing firms who consider only the dressing percentage as an index of the value of sheep for slaughter. The fact that New York butchers have been able to dispose of pelts profitably very largely explains their survival in the face of keen competition with packers.

The slaughtering departments of those packing houses equipped with wool pulleries are credited each day with the value of the pelts sent from the killing floor. The value per pelt varies, depending upon (1) size of pelt, (2) weight of fleece, (3) quality of fleece, (4) cleanness of fleece, (5) amount of grease, (6) color of wool, and (7) thickness of skin. On this basis the value per pelt at the present time (June, 1930) ranges as low as 58 cents for lambs, and as high as \$2.17 for sheep pelts in full fleece, depending mostly upon age, breeding, and season of the year. The value of the pelt plays an important part in determining the value of a sheep to the packer.

Packing houses and other wholesale butchers not equipped with wool pulleries have two methods of disposing of the pelts; they may either contract them in advance at a fixed price per pelt, or they may allow them to accumulate and then solicit bids. In the latter

case, the bidders make an examination and the pelts sell on their merits. In the former case, the packer or butcher has no incentive to pay a premium for well-wooled sheep, but, on the contrary, it is to his advantage to select those with light pelts. One prominent sheep buyer on the Chicago market designated the contract plan as "slipshod," and he stated that "eventually it must cease as competition becomes more keen." He also said, "I instruct my men to consider wool as well as meat, and when they make bids, you may be sure they have estimated the value of the pelt as well as the carcass."

Pelts are most valuable in the spring just before shearing time. Shorn sheep sell at a discount because the wool cannot be pulled at a profit until it has a growth of three-quarters of an inch or more. When the staple measures less than this, the pelts are tanned with the wool on, and the price received is small compared with pelts which can be pulled. The time of shearing marks the close of winter and the opening of pasturage, hence shorn sheep are often gaunt, and this is another reason for the lower price.

Pulled wool has the same uses as ordinary clipped wool. The weight of wool from an average pelt is 4 to 5 pounds. This seems a low figure, but the pelts are scrubbed before pulling, which takes out nearly all the dirt and grease, and causes a decided loss in weight.

After the wool is pulled, the skins are prepared for the tannery. Untanned sheep and lamb skins have a wide range of value, with an average at the present time of \$6.50 per dozen for lamb skins and \$7.50 for sheep skins. The value depends upon the size, quality, and thickness. The Merino yields a thin, porous skin which makes a leather that scuffs easily and wears out very quickly. These bring the lowest price. The best-wearing and highest-priced sheep leather is made from skins of the long-wooled breeds. Sheep leather is used for making cheap shoes, shoe linings, gloves, bags, book bindings, cheap saddles, suit cases, sweat bands for hats, and many other articles. Chamois skins are now made entirely of sheep skins. Goat skins are much in demand for furniture leather and are more valuable than sheep skins. They average a little larger in size than sheep skins and wear much better.

Other by-products of sheep.—The by-products from the slaughter of sheep may be classed as edible and inedible. The edible by-products include the tongue, which is used for cooking or sausage; the pluck, which is usually ground up and used in different kinds of sausage; and the paunch, about one-half of the paunches

being used for tripe, made by boiling and pickling the paunches. The bones, stomach, and any trimmings are tanked, thus extracting fats and oils, and the residue is treated to make glue. The final residue is made into tankage and fertilizer. The blood, dried and ground, makes blood meal and fertilizer. Hard bones yield bone charcoal for bleaching purposes, black pigment for paint, shoe-blackening, etc., bone dust for fertilizer, vitrified bone for making glass, cement for billiard balls, and knife handles, combs, buttons, and other articles. The intestines, windpipe, and bladder are cleaned and made into sausage casings. Musical strings, clock cord, and surgical ligature for sewing up wounds, as well as casings for little sausages, are made exclusively from the intestines of sheep. A class of oleo oil is made from the better grade of mutton tallow, and enters into the composition of oleomargarine. Inedible greases are used in soaps. Some valuable chemicals used in medicine are obtained as by-products from sheep. Among these are thyroidin, used as a cure for cretinism, and suprarenalin, a powerful astringent used in cases of severe bleeding. More than 130,000 sheep are required to make a pound of suprarenalin.

Conclusions

The following conclusions may be drawn from a study of sheep and lamb slaughter, carcasses, and by-products:

1. In order to dress a high percentage of carcass, sheep and lambs must be heavily fleshed, free from paunchiness, and light in pelt.

2. The pelt, especially the wool, is a valuable by-product.

3. The total by-products of sheep are relatively more valuable than those of cattle or hogs.

4. The dressing percentage of sheep, though an important factor in determining the price of the live animal, is of less importance than the dressing percentage of cattle.

5. The most profitable market lamb is fat, free from paunchiness, and carries a fairly heavy fleece of good, clean wool.

6. The same blocky form desired in the live animal is also desired in the carcass.

7. Mutton and lamb are sold as fresh meat products almost exclusively.

8. Lamb is usually superior to mutton in color, grain, tenderness, and flavor.

9. The most desired lamb carcasses fall within a narrow range of weight, 40 to 45 pounds.

10. The packer classes all carcasses which show the break-joint as "lamb" carcasses. Such carcasses are yielded by genuine lambs, by most yearling wethers, and by some yearling ewes.

11. Genuine lamb carcasses bring a higher price than yearling lamb carcasses, and the latter outsell mutton carcasses.

12. Wethers of all ages usually yield better carcasses than ewes of the same age because of greater thickness of cuts and greater compactness. Wethers are superior to bucks in quality, finish, and percentage of high-priced cuts. More of the buck's weight is in the neck, shoulders, and brisket.

13. The loin, back, and hindquarter yield the high-priced cuts of mutton and lamb—the loin, short rack, and leg.

CHAPTER XVII

AMERICAN SHEEP MARKETS

Sheep are marketed by the same methods and are shipped and sold at the central markets in the same manner as cattle, as described in Chapter V. A larger proportion of sheep pass through the central markets and relatively smaller numbers are slaughtered at local points and on farms and ranges than is true of cattle or hogs.

The 14 largest sheep markets and their receipts for three years are as follows:¹

Markets	1929	1928	1927
1. Chicago	3,784,863	3,867,882	3,829,320
2. Omaha	3,030,619	3,037,119	2,603,508
3. Denver	2,290,395	2,295,034	1,908,216
4. Ogden	1,759,000	1,525,607	1,177,505
5. Kansas City	1,752,882	1,767,007	1,615,658
6. St. Joseph	1,635,607	1,579,572	1,347,855
7. St. Paul	1,139,073	890,762	704,830
8. Pittsburgh	1,075,487	986,076	1,003,292
9. Buffalo	978,404	994,057	1,233,668
10. Sioux City	840,492	568,477	526,878
11. Pueblo	792,464	849,708	902,563
12. Salt Lake City	629,742	681,413	615,572
13. Fort Worth	539,687	457,788	444,541
14. St. Louis	534,370	510,225	574,366
Totals	20,783,085	20,010,727	18,487,772

The U. S. Bureau of Agricultural Economics reports that 26,834,489 sheep and lambs were received in 1929 at 65 stock yards in 34 states. The 14 markets listed above received 77 per cent of this total.

The Chicago sheep market is easily the largest in the world. The total value of sheep and lambs received there during 1929 was \$42,554,598. Their average value per head was \$11.25. Their average live weight was 79 pounds. Their average price per cwt. was \$14.25.

At Chicago during 1929, Armour and Company slaughtered 946,665 sheep, Swift and Company 939,972, Wilson and Company 430,834, and Morris and Company 255,646. These four companies slaughtered 96 per cent of all sheep killed by Chicago packers in 1929.

The commission charge for selling straight carloads of sheep or goats at Chicago is \$14 on single-deck cars and \$20 on double-deck

¹Compiled from Drovers Journal Year Book of Figures for 1929.

cars. On less than 50 head of sheep or goats shipped in one car, the commission is 20 cents per head. The charge for yardage is 8 cents per head. Hay costs from \$1.60 to \$2.10 per cwt., corn \$1.60 per bushel, and oats \$1.00 per bushel.

Monthly weights of Chicago sheep.—The writer tabulated the average monthly weights of sheep and lambs at Chicago for ten years, 1920 to 1929 inclusive, and then determined the monthly averages for the entire ten-year period. The average weight for March at 85.9 pounds was highest, and the average for June at 74.3 pounds was lowest. The September average at 75.2 pounds was nearly as low as June. Spring lambs evidently account for the June low average, and the fall run of western lambs accounts for the low averages in September and October. The between weights are higher. The general average for the ten years was 78.7 pounds. March weights were highest in 8 of the 10 years. June weights were lowest in 6 of the 10 years. Following are the ten-year averages:¹

Monthly average weights of sheep and lambs at Chicago for ten years

Month	Weight Pounds	Month	Weight Pounds
January	81.8	July	76.2
February	84.1	August	76.9
March	85.9	September	75.2
April	84.5	October	75.4
May	79.3	November	77.2
June	(74.3)	December	80.5

Shrinkage in shipping.—Henry and Morrison report the following figures relative to shrinkage of sheep and lambs in transit:²

Range lambs shipped 1,440 miles shrank from 4.6 to 8.7 per cent and averaged 7.6 per cent. Native lambs shipped 135 to 149 miles shrank 1.3 to 6.8 per cent. Lambs under 100 pounds in transit 4 days shrink 7 to 8 pounds.

Yearling wethers weighing about 120 pounds and in transit 4 days shrink about 10 pounds.

Aged wethers and ewes in transit 4 days shrink about 12 pounds. Two-year-old wethers shipped 1,440 miles shrank 5.1 to 8.6 per cent and averaged 6.8 per cent. These figures are based on "filled" weight at the market.

The fill.—Upon their arrival in the pens at the market, sheep are fed hay and grain and are watered. This constitutes the "fill," and it is important because it has a quieting effect, improves the appearance, and increases the weight of the animals.

¹ Compiled from Drovers Journal Year Books of Figures.

² Feeds and Feeding, 1915, p. 519.

Sorting and selling.—Mixed loads of sheep and lambs containing both killers and feeders may be sorted by the commission man prior to selling them, or he may sell them to a packer buyer or order buyer with the privilege of sorting or cutting out an agreed percentage or number of them. The remaining animals may then be sold to a feeder buyer. Mixed loads composed mostly of feeders may be sold to a trader who buys them all. He then sorts them and sells the fat end as killers and the thin end as feeders. Commission men also sell some loads straight without sorting to packers, order buyers, and feeder buyers, but a large proportion of receipts require preliminary sorting or sale to traders in order to realize the best price for them.

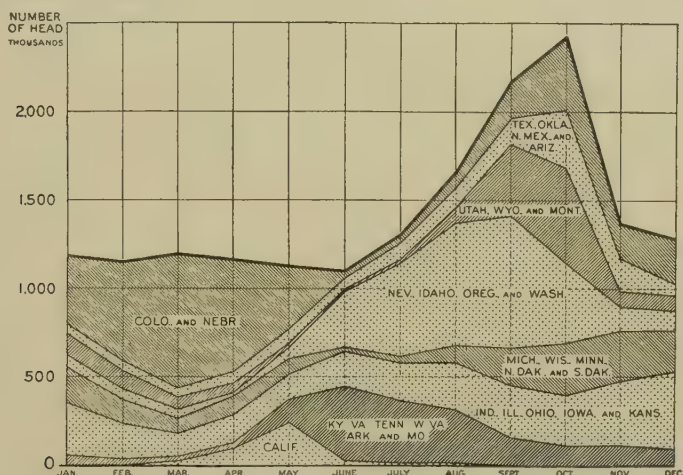


FIG. 84.—Origin of market receipts of sheep and lambs in the year 1925 for all public stock yards in the United States.

Commission men and buyers must handle all sheep, except shorn sheep, in order to determine their condition, smoothness, density of wool, and market value. It is impossible to buy and sell sheep on the basis of their general appearance as cattle and hogs are bought and sold at the markets. Different market men use different methods of handling. One man may feel of the loin, another the back and ribs, and another the dock. Sometimes both back and dock are handled. The most common practice is to grasp the back and ribs with thumb and fingers spread out to full width. In sorting, the thin sheep or the fat sheep are marked on the backs with chalk. Then the load is driven in single file through a narrow chute at the end of which is a small "dodge gate" controlling the entrance to two pens. The sheep marked with chalk are admitted to one pen and those unmarked pass into the other.

Seasonal variations in receipts and sale of sheep at Chicago.—Fig. 85 shows the average monthly receipts of sheep and lambs at Chicago for ten years. Largest receipts occur in September and October, when heavy shipments arrive from western ranges. A rapid rise begins in July and reaches a climax in September and October. During the ten years largest receipts occurred in September 6 times and in October 4 times. In 8 of the 10 years, lowest monthly receipts were registered from April to June inclusive. June is the month of smallest average receipts. September receipts average 73 per cent larger than June receipts.

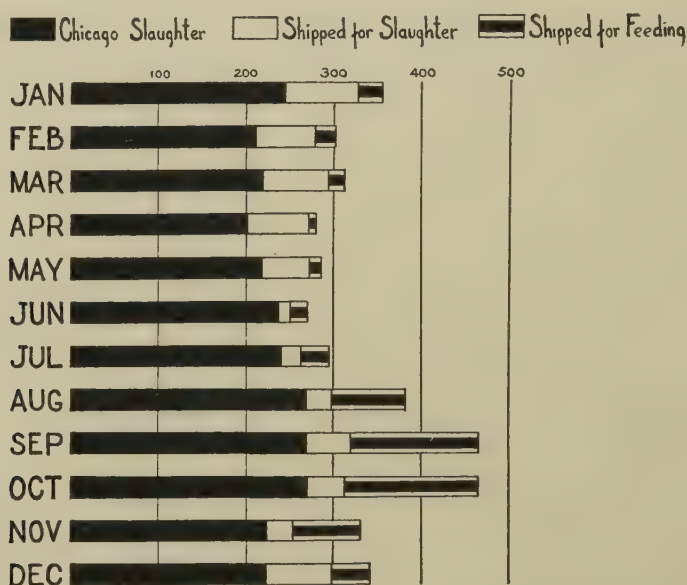


FIG. 85.—Average monthly receipts and shipments of sheep and lambs at Chicago in thousands for ten years, 1920-1929. The total length of each bar represents average monthly receipts. The divisions of the bar represent the average number of Chicago sheep and lambs sold monthly for local slaughter, shipment to other points for slaughter, and shipment to the country for feeding (or breeding) purposes.

As shown in the chart, 69 per cent of the sheep annually received at Chicago are slaughtered there. The number shipped monthly to other points for slaughter is quite variable, but for the year includes 15 per cent of total receipts. The number shipped for feeding varies widely in different seasons and averages 16 per cent for the year.¹ During the first six months of the year less than 6 per cent of receipts are sold as feeders. During 8 of the 10 years

¹Shipments of sheep from the markets for breeding purposes are not counted separately, but are included as feeders.

included in this study, smallest feeder shipments occurred in April and May. In the other 2 years smallest shipments occurred in March and June respectively. During 6 of the 10 years studied, largest feeder shipments were made in October, and during the other 4 years largest shipments were made in September. The ten-year averages show that during the last six months of the year a little over 23 per cent of receipts are sold for feeding purposes. In September about 31 per cent and in October about 33 per cent of the month's receipts are sold for feeding. Sixty per cent of all the feeders sold during the year are sold in August, September, and October, and over 71 per cent are sold in these three months and November. It is fortunate that there is a large demand for feeders during fall months when receipts are very large. This greatly aids in maintaining prices for killing sheep and lambs at the time when prices are usually lowest. Without this large feeder outlet, the price of sheep for slaughter would be much lower in the fall.

The principal feeder sheep markets and the numbers of feeders shipped during 1927, 1928, and 1929 are as follows:¹

Markets	1929	1928	1927
1. Denver	1,191,550	1,046,840	1,156,156
2. Omaha	975,666	934,441	895,155
3. Ogden	692,701	629,016	344,056
4. Chicago	523,676	436,468	502,547
5. St. Joseph	381,060	328,785	242,619
6. Salt Lake City	339,987	317,390	345,580
7. Pueblo	304,069	315,127	344,492
8. Kansas City	261,722	350,675	353,591
9. Sioux City	228,748	102,448	105,803
10. Amarillo	177,970	75,057	138,052
11. St. Paul	136,217	110,126	88,851
12. Fort Worth	83,814	81,139	47,179
Totals	5,297,180	4,727,512	4,564,081

It will be noted that the rank of these markets is not the same as their rank in total receipts. Markets receiving the largest numbers of western sheep rank highest as feeder sheep markets. These 12 markets handled 95 per cent of the total number of feeder sheep and lambs handled by 65 markets in 1929.

¹ Compiled from Drovers Journal Year Book of Figures for 1929.

CHAPTER XVIII

MARKET CLASSES AND GRADES OF SHEEP

Three general classes of sheep are recognized at the large live-stock markets. Each of these general classes is divided into two or more classes, and most of the classes are in turn divided into grades. The three general classes and their requirements are briefly as follows:

1. **Mutton sheep**—including all lambs, yearlings, wethers, ewes, bucks, and stags sold for slaughter.

2. **Feeder sheep**—including all lambs, yearlings, wethers, and ewes sold for feeding purposes.

3. **Breeding sheep**—including ewes and bucks sold for breeding purposes.

The grades.¹—The sheep within a class are graded according to their relative value. The grades are (1) prime, or fancy selected, (2) choice, (3) good, (4) medium, and (5) common. The term "fair" means the same as "medium," and is frequently substituted for it. "Inferior," "poor," and "culls" are terms sometimes substituted for "common." In some classes there is no grade better than choice, and in other classes there are no grades better than good. As the term "prime" indicates a high degree of condition or finish, the best grade of feeder lambs and breeding ewes is termed "fancy selected."

Native and western sheep.—Before describing the market classes and grades, some of the general descriptive terms used in the sheep market need explanation. As applied to market sheep, these general terms have little direct bearing on the market classification, but they serve to indicate, in a more or less general manner, where the sheep were raised, the nature of their breeding, and how they were fed.

"Native sheep" are those produced in the small farm flocks of the Central West, East, and South. "Western sheep" are those produced in the large range flocks of the West. Western sheep are very largely of Merino breeding, whereas natives have mostly a mutton ancestry. Western sheep are usually white faced and more or less wrinkled, particularly below the neck; native sheep are mostly brown faced and are usually free from wrinkles. Range sheep are more uniform in appearance than natives and are nearly always

¹ For definitions of market class and grade, see page 123.

docked and castrated, while many native sheep and lambs come to market undocked and uncastrated. In the West, sheep are produced on pasture and hay almost exclusively. Many range-bred sheep are sold to the central states for fattening on grain and roughage. At the markets and in market reports, western sheep are frequently distinguished by the name of the state in which they were produced, as "Colorados," "Montanas," "Mexicans," "Idahos," etc. The mutton and breeding classes include both native and western sheep, but the feeder class, as a rule, includes western sheep only. Many native lambs in feeder condition are not desirable for feeding because they are undocked and uncastrated. Furthermore, native sheep and lambs that reach the market in low condition seldom sell as feeders because they are usually infested with internal parasites, thus making it difficult or impossible to fatten them.



FIG. 86.—Prime native lambs.

The stomach worm of sheep, *Haemonchus contortus*, is one of the most serious pests affecting live stock. Sheep of all ages are subject to it, but infested lambs show much more serious effects than do mature animals. The lambs become infested from the older sheep through the medium of the pasture. The symptoms are anemia, loss of flesh, general weakness, dullness, thirst, loss of appetite, and diarrhea. No treatment has been found that will rid a flock of this pest, although dosing with a solution of copper sulphate, "Black Leaf 40," (a 40 per cent solution of nicotine sulphate), or with gasoline is fairly satisfactory and will hold stomach worms in check so that they will not seriously injure the flock. The best means of combating the parasite is by preventative measures. Rotation of pastures is imperative. Permanent pastures for farm flocks are almost certain to cause trouble. The western sheep owner

with great areas of pasturage is able to keep his flock on fresh ground, while on farms this is possible but, unfortunately, is not often practiced. Hence western sheep have a great advantage over native sheep for feeding purposes.

The term "fed" when prefixed to the name of a class indicates that the sheep were fattened on grain rather than on grass alone. Sheep that were sheared shortly before their arrival at market are termed "shorn" as distinguished from "wooled" sheep.

Market Classes and Grades of Sheep

Following is the complete outline of the market classes and grades of sheep and lambs:

Classes		Grades	
MUTTON SHEEP:			
Lambs	{ Light and handy weight, 85 lbs. down.....	}	Prime, choice, good, medium, common
	{ Medium weight, 85-95 lbs.		
	{ Heavy weight, 95 lbs. up		
	{ Spring lambs.....		
Yearlings	{ Light weight, 90 lbs. down	}	Prime, choice, good, medium, common
	{ Medium weight, 90-100 lbs.		
	{ Heavy weight, 100 lbs. up		
Wethers		Prime, choice, good, medium, common	
Ewes		Choice, good, medium, common	
Bucks and stags		Good, medium, common	
FEEDER SHEEP:			
Lambs		Fancy selected, choice, good, medium, common	
Yearlings		Choice, good, medium, common	
Wethers		Choice, good, medium, common	
Ewes		Choice, good, medium, common	
BREEDING SHEEP:			
Ewes	{ Yearlings and twos }	}	Fancy selected, choice, good, medium, common
	{ Threes and over... }		
Bucks			
MISCELLANEOUS:			
Hot-house lambs			
Throw outs			
Canners			
Dead sheep			
Goats			

As shown above, each of the general classes includes two or more classes or divisions according to age or sex, and some of these classes are in turn divided according to weight or age. All of the more important classes are divided into three or more grades according to the comparative merits and faults (values) of the animals in the class. The division into grades is more arbitrary than the division into classes.

Mutton Sheep

Mutton sheep constitute a general class including all sheep and lambs which are sold for immediate slaughter. Most of them are sold to local packers, but some of the better grades are sold to order buyers who ship them for slaughter to eastern cities. The classes of mutton sheep are lambs, yearlings, wethers, ewes, and bucks and stags.

Lambs.—The lamb class, including wether, ewe, and buck lambs, is the most numerous and most important class of mutton or killing sheep. A survey of Chicago receipts by the U. S. Bureau of Agricultural Economics shows that 82 per cent of all receipts consist of lambs, while 10 per cent are ewes, 2 per cent are yearlings,



FIG. 87.—Prime western lambs.

and 6 per cent are wethers, bucks, and stags. Lambs are most profitable to the producer because their cost of production is less and because their market price is higher than that of any other class. Consumers prefer lambs to older animals because of the better flavor and greater tenderness of the meat.

At 12 to 14 months of age, lambs become yearlings, ewes, or bucks. Western lambs mature more slowly than natives because of their Merino breeding and because they are not ordinarily as well fed. The slower maturity of the western lamb is something of an advantage, enabling it longer to enjoy the advantage in price which lambs have over older animals. Western lambs may be purchased

in the late fall for feeding during winter and spring, and upon their return to market in May they will still class as lambs, while native lambs of the same age and similarly managed would class as sheep.

In the late spring and early summer the market receives lambs born the year previous, and also young lambs born within the year. The latter are called "spring lambs" to distinguish them from the older lambs. Therefore, at this season there are two classes of lambs, known respectively as "lambs" and "spring lambs." The latter command the higher prices. On the Chicago market this distinction is made from about the first of April to the middle of June. After June 15, the lambs of the previous year become yearlings, ewes, and bucks, and the spring lambs are designated simply as "lambs."

Guy C. Smith of the Commercial Research Department of Swift and Company states:¹ "Lambs begin moving to market first from California. This occurs in April and extends through June. Then come Texas lambs running through May, June, and July. These are followed by lambs from Kentucky and Tennessee which begin coming in June and extend through August. These are followed by lambs from Virginia and Maryland in July and August. Spring lambs from the north central states are marketed chiefly from July to November and from eastern Canada during September and October. The lambs from the range states run from September to November while fed lambs from the north central states are marketed from December through to April."

To the foregoing it may be added that Colorado uses peas, corn, beet by-products, and alfalfa extensively in lamb feeding, and that in Idaho, Montana, and other western states, lambs are frequently kept over and finished during fall and winter on hay, with or without the addition of grain.

The grades of killing lambs are prime, choice, good, medium, and common. The grade of a lamb depends upon its form, quality, condition, and weight.

Prime lambs.—Only the best lambs, or those that are superior in form, quality, condition, and weight, are graded as prime, and comparatively few lambs received at the markets can qualify as prime lambs. They are used to supply the demands of the fancy city market, hotel, club, and restaurant trade. (See Figs. 86 and 87.)

1. Form.—The buyer demands the form that shows the most development of loin, back, and leg of mutton, these being the re-

¹ *Geographic Influences in Marketing Illustrated by the Meat Industry, Journal of Geography*, Oct., 1921, pp. 247, 248.

gions of high-priced cuts. The lamb should be broad, deep, short of leg, and free from paunchiness. Fullness and smoothness of form are important as indications of high condition, thickness and evenness in fleshing, and a high dressing percentage. Undocked lambs are discriminated against because of greater waste in dressing and because a long tail indicates that the producer was careless in his methods of feeding and management.

2. Quality.—The indications of quality are a medium-sized, clean-cut head, fine bone, and smooth form and fleshing. These insure fineness in texture of flesh, increase the dressing percentage, and add to the attractive appearance of the carcass; hence quality is an important factor in determining the grade and price of lambs.

3. Condition or finish.—Lambs fatten more slowly than mature sheep and the lamb is seldom made too fat, while in the finishing of older animals this is easily possible. A high degree of finish in the lamb is desired because the fat lamb dresses a higher percentage of carcass than the thin lamb; the carcass is more attractive in



FIG. 88.—Choice western lambs.

appearance; and fat meat, especially meat interspersed with fat, called "marbling," is more tender and juicy and of better flavor than lean meat. The lamb's covering of flesh should be deep, even, smooth, and firm, yet springy to the touch. High condition is indicated by a thick covering over the loin, back, and ribs; by fullness of neck, breast, and flanks; and by a thick dock and mellow purse.

4. Weight.—The most desirable lamb is the handy-weight lamb weighing 80 pounds. Three divisions are made in the lamb class according to weight—light and handy weight, medium weight, and heavy weight. These are important because weight is a prominent factor in determining the grade and price of lambs. W. C. Coffey, formerly of the Illinois Experiment Station, states that

early spring lambs with quality and finish may easily command top prices when they weigh little more than 60 pounds, and that during summer months lambs weighing 65 to 70 pounds are in strong demand, but that there never is a time when lambs weighing 80 pounds will not sell as prime if they have fancy form and quality and prime condition. He also states that the best native lambs weighing 100 pounds occasionally sell as prime lambs, though such cases are exceptional, and he adds that a slight departure from the most popular weight does not lessen the price of the lamb as much as an equal departure from the most desirable quality and condition.¹

Foreign material and moisture in the fleece add to the weight, injure the appearance, and lessen the dressing percentage. Buyers



FIG. 89.—Good lambs.

either refuse to bid on wet sheep or offer prices which make allowance for the added weight. At most central markets the sheep and hog pens are under roof, but sheep may have wet fleeces upon their arrival in the pens. Mud, sand, manure, and other foreign material in the fleece also result in lower prices. It pays to market all sheep in clean condition.

Choice lambs.—This grade includes most of the better lamb offerings upon the Chicago market. Lambs cannot be very deficient in form, quality, finish, or weight, and grade as choice. Deficiency in quality or in weight frequently accounts for failure to grade as prime, but lack of condition is the most common cause. (See Fig. 88.)

Good lambs.—Marked deficiency in form, quality, condition, or weight, or a slight deficiency in each, puts the lamb into the good

¹ Ill. Bul. 129, Market Classes and Grades of Sheep, p. 584. The writer is indebted to this bulletin for many of the specifications included in this chapter relative to the market classes and grades.

grade. Lack of quality and lack of condition are the most frequent causes of failure to grade higher than good. (See Fig. 89.)

Medium lambs.—Here the form is frequently faulty, and the condition and quality fall far below the standard. Long, narrow, rough lambs much lacking in flesh grade here. They are often paunchy. Western lambs which lack condition usually classify as feeders unless they are very coarse, hence this grade is mostly filled by native lambs.

Common lambs.—Coarse, rough, thin lambs grade as common. Many of them are of very light weights, ranging from 30 to 50 pounds. However, coarse buck lambs and those which are staggy because of late castration also grade as common, and these some-



FIG. 90.—Common lambs.

times weigh up to 100 pounds. Failure to castrate, failure to castrate at the right time, and infestation by internal parasites frequently explain the common lamb's coarseness and thin condition. Western shepherds do not neglect to dock and castrate, and western lambs are free from internal parasites. The majority of common lambs are natives.

Many uncastrated lambs still come to market and they are discriminated against rather severely at times by buyers. Ram lambs are so restless that they do not acquire the finish of wether lambs. This is especially true after they have reached the age of 3 or 4 months. Tests have shown that wether lambs make 11 per cent more gains in weight than do ram lambs under similar conditions,¹ and the difference in fatness is much more marked. Lambs should be docked and castrated when from 7 to 10 days old.

¹ J. B. Spencer: Sheep Husbandry in Canada, Dom. Can. Dept. Agr. Bul. 12, p. 59.

Why some lambs sell at a loss.—An editorial in the *National Stockman and Farmer* of August 5, 1922, entitled "A Lamb Market Lesson," contained the following: "On an eastern market last week a buyer had orders for three carloads of choice fat lambs and couldn't find them. On the same day and market another buyer had orders for feeder lambs and couldn't get them. Yet there was a big supply of lambs on the market that day, more than sellers could dispose of, and prices broke badly. There is a reason for everything, and there are reasons why a market may have too many lambs and too few at the same time. The scarcity of good fat lambs this year is due in part to the season. Most of the lambs from east-



FIG. 91.—Prime western yearlings.

ern territory come off grass, and the grass has not made them so fat as usual this time. * * * The scarcity of feeder lambs on that market was due entirely to failure to dock and castrate. Most of the lambs were in feeder flesh but unfit to go back to the country because they had not been docked and castrated. Hence they had to sell at meat prices, and a light, thin lamb is worth about as little for meat as anything that stands on four legs. There is certainly one lesson for producers here, possibly two. Will we learn either of them?"

Yearlings.—This class includes yearling wethers only. Yearling ewes and bucks are excluded. As shown in Chapter XVI, yearlings are used as a substitute for lambs in the meat trade. The yearling's ability to substitute for lamb depends upon his weight, condition, quality, and form, and the nearer he approaches the

prime lamb in these respects, the higher price he will bring. Most yearling wethers will "break" at the break-joint (described in Chapter XVI) but most yearling ewes will not. Because the yearling ewe cannot be relied upon to show the break-joint, the term "yearling" on the sheep market means yearling wethers only. The supply is very limited.

Yearlings are designated according to weight as light weights, medium weights, and heavy weights. Weight is important because the yearling is valued in proportion to his resemblance to the prime lamb. Light weights ranging from 80 to 90 pounds are preferred.



FIG. 92.—Good yearlings.

Relatively few yearlings weighing over 90 pounds grade higher than choice, and few heavy-weight yearlings (100 pounds and up) grade higher than good. However, high condition is of even greater importance than weight. A thin yearling of the right weight is not a good lamb substitute. The higher grades of yearlings combine light weight and high condition. The lower grades are deficient in both respects. The grades of yearlings are prime, choice, good, medium, and common. These closely resemble the similar grades of lambs which have been described.

Wethers.—This class is composed of mature wethers. The supply of these is very limited and is diminishing because their production is not economical or profitable. Practically all of them are westerns. Their carcasses supply hotel, club, restaurant, and other

trade where the heavier cuts may be used to advantage. Extremely fat "gobby" wethers and big, plain wethers are discriminated against. The grades are prime, choice, good, medium, and common, chiefly according to form, quality, and condition.

Ewes.—Old ewes discarded as breeders and surplus breeding ewes chiefly compose this class and wide differences are noticeable in the age, condition, and weight of offerings. The supply of ewes for killing purposes is much larger than that of wethers, and most mut-



FIG. 93.—Prime native wether.

ton carcasses are ewe carcasses. As a rule, ewes dress a lower percentage and yield proportionately less lean meat than wethers, and hence bring a lower price. The higher grades of ewes supply hotel and restaurant trade, while the lower grades supply the demand for cheap mutton in cities and elsewhere. The grades of ewes are choice, good, medium, and common, according to form, quality, and condition. The higher grades are relatively scarce. Advanced age and low condition feature the common grade.

Bucks and stags.—The supply of these is limited and they are of no special importance to the producer of mutton. The grades are good, medium, and common.

Feeder Sheep

The chief distinction between mutton sheep and feeder sheep is the degree of condition. Other differences are noticeable, however, for sheep and lambs are not in demand as feeders unless they are at least reasonably good in form, quality, and constitution. After packers have selected those animals which are in desirable condition for killing purposes, there remains a large number which are more or less lacking in finish. From among these, feeder buyers select those which are of desirable form, quality, constitution, and weight for feeding purposes. Frequently packer buyers compete with feeder buyers for such sheep, and the high bidder gets them.



FIG. 94.—Common western wethers.

If there are more of them than feeder buyers can use, the packer must take a number of them, but if the supply is rather limited the feeder buyer usually gets most of them. In addition to the foregoing, the sheep market receives inferior animals of all ages, sexes, and weights, which are too thin to be good killers and which cannot be sold as feeders because they are coarse and rough, old, unthrifty, lacking vitality, inferior in form, lame, uncastrated, undocked, burry, black, open fleeced, badly wrinkled or otherwise undesirable. These sell for slaughter and fill the lower grades in their respective classes.

The supply of feeders and the demand for them is greatest during August, September, and October, when large shipments are received from the West. As previously explained, practically all

sheep sold from the markets as feeders are those grown on western ranges. During the last few years, however, due to increased demand for feeders and somewhat lessened receipts of westerns, some increase has been noticeable in the number of native lambs accepted for feeding purposes. The classes of feeder sheep are lambs, yearlings, wethers, and ewes.

Feeder lambs.—This is the most important and by far the most numerous class of feeder sheep. The grades are fancy selected, choice, good, medium, and common.

Fancy selected feeder lambs include a relatively small number of high-class lambs that carry more condition and weight than the



FIG. 95.—Fancy selected feeder lambs.

bulk of feeder lambs and hence require only a short feeding period to finish them into prime lambs. The range in weight is from 65 to 70 pounds. They must show very good breeding, excellent form, high quality, strong constitution, dense fleeces of clean wool, and marked uniformity in type and size.

Choice feeder lambs.—Most of the better lambs purchased for feeding purposes are of the choice grade rather than fancy selected. Under good management and with a longer feeding period they may be finished into prime lambs. The points which determine the grade and value of a feeder lamb are weight, breeding, form, quality, constitution, condition, fleece, sex, and uniformity.

1. **Weight** is of great importance because of the packer's preference for handy-weight lambs. In selecting feeder lambs it is essential to select weights which will permit of taking on a finish without exceeding an 80 to 85-pound limit when the animals are

returned to the market. Therefore the weight selected will depend somewhat on the condition of the lambs. If they are lacking in flesh to a marked degree, lighter weights must be selected than in the case of feeder lambs carrying more flesh. A very popular weight for the bulk of feeder lambs is around 55 pounds, though choice feeder lambs, which carry somewhat more flesh than the average, weigh from 55 to 65 pounds. As a rule, the 55-pound lamb can be finished in the usual 90 to 120-day feeding period at a weight of around 80 pounds. Western lambs usually make average monthly gains on feed of from 8 to 10 pounds per month, including considerable time required to get them safely on full feed.



FIG. 96.—Good feeder lambs.

2. Breeding.—All western lambs carry considerable Merino breeding, but the percentage varies greatly. Those strongest in Merino breeding are very much wrinkled, narrow and leggy, very uneven in their lines, and have white faces and legs. Lambs from western flocks which have used mutton rams extensively are preferred. They are free from wrinkles, more blocky and low-set in form, fairly straight in their lines, and often show brown spots and more or less of a brown coloring on the face and legs. Such lambs are usually thicker fleshed, have greater capacity for feed, and finish more rapidly than those which are especially strong in Merino breeding. Lambs of very inferior type, coarse in head and bone, rough in form, or unthrifty and weak in appearance are usually of inferior breeding from flocks where grade or scrub sires are used, and are to be avoided for feeding purposes.

3. Form.—Making due allowance for lack of condition, the form desired in the feeder lamb is similar to that desired in the prime lamb. If the front legs “come out of the same hole,” as the

saying goes, and the form is narrow and decidedly rangy and leggy, the lamb is a slow finisher, though it may make good gains in growth. The wide, deep, moderately compact, fairly low-set, straight-lined, full-middled lamb not only makes the most satisfactory gains and finishes the quickest, but it brings the highest market price when finished. Paunchy lambs are discriminated against. Because of their Merino breeding, western lambs are usually not as good in form as in quality, but the form here described represents the desired standard.

4. Quality.—A high degree of quality is desired, as shown by neatness of head, fineness of bone, and smoothness of form. These features should not be so pronounced as to result in weakness of constitution and lack of vigor, but they should be well marked. Coarseness and roughness are decidedly objectionable.



FIG. 97.—Common feeder lambs.

5. Constitution and thrift.—Width and depth of middle, full heart-girth, short neck and legs, and a fair degree of style and activity, are indications of constitution, thrift, and vigor. Lame, inactive, and weak lambs should be rejected.

6. Condition.—Lambs so thin as to be emaciated and weak are discriminated against, as it is a question whether they will respond to feeding, and there is danger of losing a considerable number of them before they are finished. Feeder lambs should carry enough condition to make them reasonably full in their outlines, thrifty, and healthy.

7. Fleece.—A fairly dense fleece of clean white wool affords protection during winter feeding and assists in selling at top prices to packer buyers. It is true that the best carcass is seldom found

under the heaviest and densest fleece, but a good, clean fleece on the feeder lamb is desirable for the reasons mentioned. Black lambs spoil the appearance of the load, and burry fleeces and those in very dirty condition lessen the value of the finished lambs.

8. **Sex.**—Buck lambs are disqualified for feeding purposes for reasons previously mentioned. Wether lambs are slightly preferred to ewe lambs, but no sorting is done on this account, both wethers and ewes being taken without making any distinction as to price.

9. **Uniformity** is highly desirable because it gives a sameness in size and type that is the best guarantee of uniformity in gains and finish, and it adds greatly to the appearance of the load on the market.

Good feeder lambs are about average in their qualifications for feeding purposes, yet capable of making satisfactory gains. Many of them are deficient in form and quality. They average lighter in weight and lower in condition than lambs of the choice grade, and require a longer feeding period to finish them.

Medium feeder lambs are deficient in weight, breeding, form, quality, constitution, and condition, and are less uniform than the higher grades. Many of them are decidedly long, leggy, and angular in form, and their wrinkled skins are evidence of much Merino breeding.

Common feeder lambs are mostly very small, light-weight lambs that are much lacking in thrift and vitality. They weigh from 25 to 45 pounds and require a long feeding period and careful management to finish them. They have one advantage in that they may be returned to market late in the season weighing 80 pounds or less, at which time such weights enjoy a maximum premium in competition with the heavy lambs which are then plentiful. Common feeder lambs also include some lambs of heavier weights which are very coarse in quality and rough in form. Uniformity is decidedly lacking.

Feeder yearlings.—This class is composed of yearling wethers, and, as the mutton yearling should be able to substitute for lamb, quality and weight are of great importance in grading feeder yearlings. They are not a prominent feature in the feeder trade, as but few appear on the market. The grades are choice, good, medium, and common.

Feeder wethers.—The supply is very small. The grades are choice, good, medium, and common.

Feeder ewes.—Most ewes suitable for feeding bring a higher

price when sold for breeding purposes, hence the supply of feeder ewes is small. They exhibit considerable variation in condition, quality, and thrift. The grades are choice, good, medium, and common.

Breeding Sheep

This general class includes the breeding ewe and breeding buck classes, the latter being of very minor importance. The ewes in greatest demand and most commonly sold for breeding purposes are two to four years old, though ewes of all ages sell for breeding, even ewe lambs being taken out at times to be developed for use as breeders. For convenience in quoting prices, two divisions may be made in breeding ewes according to age, one including the yearlings and two-year-olds, and the other the older ewes. The younger ewes sell at higher prices. This is chiefly because packers, who bid on all ewes, bid highest on young ewes. Young ewes, especially yearling ewes, are of handier weights, are usually in higher condition, and some of them have the break-joint and can be sold in the carcass as lambs. Heavy ewes almost invariably sell on the market at a discount, and it logically follows that a breeding ewe buyer can purchase these heavier ewes for less money per cwt. than the lighter and younger stock. Furthermore, two to four-year-old ewes produce a greater percentage of lambs and thriftier lambs on the average than ewes of either greater or younger age. Nevertheless, the breeder buyer can afford to pay a higher price per cwt. for a yearling because she weighs less and because she can be used in the flock for a longer period. For all these reasons young breeding ewes command higher prices but are less sought after by breeder buyers than are ewes two to four years old.

W. C. Coffey states ¹ that the most desirable breeding ewes are dark-faced natives in ordinary field condition. He states: "Dark-faced ewes sell better than those that are otherwise their equals, because their lambs, being dark faced, sell better than light-faced lambs on the eastern markets. Western ewes are very popular for breeding purposes in certain localities, as Ohio, Michigan, and western New York, and many engaged in the trade think they should be preferred over natives because they are more hardy and comparatively free from internal parasites."

The grades of breeding ewes are fancy selected, choice, good, medium, and common.

Fancy selected breeding ewes.—The supply of this grade at

¹ Ill. Bul. 129, Market Classes and Grades of Sheep, p. 627.

the markets is very limited and at times entirely lacking. Fancy ewes are medium-wooled, dark-faced natives which plainly show in their form, fleece, and markings that they are well-bred, high-grade ewes of Shropshire or other dark-faced breeding. They must be high-class in every respect, stylish, and very uniform in appearance.

Choice breeding ewes.—Most of the better breeding ewes available at the market belong to the choice, rather than to the fancy grade. Choice ewes must be in thrifty, vigorous condition. Since very fat ewes are not usually satisfactory breeders or good mothers and since packers pay a premium for finish, such ewes ordinarily sell to packer buyers, while buyers of breeding ewes make their selections from those carrying moderate flesh. Choice ewes must be superior in breeding, form, quality, constitution, and fleece, and sound in mouth and udder. They should be smooth, low-set, symmetrical, and moderately compact in form, and in common with all breeding females they should have wide, deep, roomy middles, providing ample feeding and breeding capacity, and full heart-girths, indicating strong constitutions. They should have straight, strong tops. They should possess a high degree of quality and femininity as shown by refinement of head and face, trim necks, and bone of medium size. They should have dense, clean fleeces of a good quality of wool.

Concerning the matter of soundness in breeding ewes, W. C. Coffey states:¹ "A broken mouth, which means missing teeth or teeth worn down short, indicates advanced age, and although ewes may otherwise look desirable for breeding purposes, they cannot grade as choice if the teeth are not intact. It is necessary that the choice breeding ewe have a sound udder, and it is pronounced sound when it is soft and pliable to the touch, without abnormal development on either side. Any ewe not having a sound udder should be rejected as a breeder, but in the good and common grades some carelessness is exhibited in this respect."

Good breeding ewes approach choice ewes in many respects, but are rather deficient in form, quality, condition, and other essential points.

Medium breeding ewes include many ewes rather advanced in age and only fair in form, quality, and other requirements. Buyers of this grade are not particular as to markings and soundness. Medium breeding ewes are decidedly plain and much lacking in uniformity.

¹Ill. Bul. 129, p. 629.

Common breeding ewes show advanced age, mixed breeding, and inferior type.

Breeding bucks.—Rams are taken out of the Chicago and other markets for breeding purposes, but most of them are of poor form and mixed breeding. Anyone who has visited the sheep pens at Chicago or at any other large live-stock center will testify that the breeder who goes to the open market to select sires will never succeed in raising the merit of his flock above the level of mediocrity. The practice is unjustifiable and unprofitable.

Miscellaneous

Hot-house lambs.—These are lambs produced out of the usual season and marketed during the winter at 8 to 10 weeks old. They



FIG. 98.—Canner ewe.

must be fat and weigh from 40 to 55 pounds. They are a fancy product and go to a special class of trade. The central markets receive practically no hot-house lambs. The men who have made the most profit from the production of hot-house lambs are those who cater directly to the eastern hotel and restaurant trade. The practice is to slaughter the lambs on the farm where they are produced, and pack the carcasses in ice for shipment, small shipments being made regularly during the winter and early spring. The best prices are paid for them from Christmas to the middle of March.

Throw outs.—When bands of lambs reach the market they are at once sorted into the mutton and feeder classes. The buyer of

the feeders usually has the privilege of rejecting those not suitable for feeding purposes. The rejections, called "throw outs," are made up of lambs that are lame, unthrifty, blind, uncastrated, undocked, over weight, under weight, badly wrinkled, sore mouthed, burry, black, low backed, or open fleeced. They are purchased by small city butchers who have a cheap trade. They sell at common-lamb or medium-lamb prices.

Canners are mostly old thin ewes, but the canner class includes all sheep and lambs sold for slaughter that are so entirely lacking in fat and so deficient in flesh that they cannot be sold over the butcher's block as chops or roasts. They are also too aged and too deficient in condition and vitality to sell for feeding purposes. Some canner carcasses are sold to meat dealers who have a trade demanding the cheapest mutton for stewing or boiling purposes. Some are packed as potted meats, meat loaf, "roast mutton," and sausage.¹ Canners are most numerous during the fall and early winter months.

Dead sheep.—Sheep which die in transit are valued chiefly for their wool, and many of them arrive with the fleeces in such bad condition that the shipper gets no return.

Goats are important farm animals in the rough, semi-arid Edwards Plateau region of Texas, and in the valleys and plateaus of New Mexico and Arizona. The Willamette valley of Oregon also has a considerable number. Texas has over half of the 3,500,000 goats of the country, nearly all of them on the Edwards Plateau which embraces eight counties. In that region, in many sections of the South, and in western Oregon, goats are used in large numbers in clearing up cut-over land. In Texas and Oregon the goats are mostly Angoras; in Arizona and New Mexico the Angoras predominate, though other breeds are common; while in the South practically none of the goats are raised for their fleece.²

Arthur C. Davenport states³ that not enough goats are received at most markets to attract any attention or to cause any very widely recognized grades to be established. He states that they are classified as killers and as feeders or "brushers," and that young goats, or kids, fat enough for meat sell quite readily but at lower prices than fat sheep or lambs. Angoras in feeder condition are taken to the country to graze down and destroy brush and weeds.

Only 21,287 goats were slaughtered under federal inspection

¹ Ill. Bul. 147, p. 230.

² U. S. Dept. Agr. Yearbook, 1921, p. 486.

³ The American Live Stock Market — How It Functions, p. 142.

at 801 establishments in the United States in 1929, as compared to 13,769,098 sheep.¹

Sheep Prices at Chicago

Chicago prices during 1929.—The lowest and highest prices and average prices paid on the Chicago market for the various classes of sheep in 1929 were as follows: ²

Class	Range in price	Average price
Mutton lambs.....	\$9.00-18.10	\$14.30
Native mutton lambs.....	9.00-17.85	14.20
Western mutton lambs.....	9.75-18.10	14.45
Spring lambs.....	13.00-25.00	.....
Mutton yearlings	6.00-15.50	11.50
Mutton sheep	1.50-13.50	6.35
Native mutton sheep.....	1.50-12.25	6.20
Western mutton sheep.....	2.00-13.50	6.40
Feeder lambs.....	9.00-16.75	12.75
Feeder sheep and yearlings.....	2.00- 8.00	.....
Breeding ewes.....	5.00-12.50	.....

Market values of the various classes.—The comparative market values of the classes of mutton sheep are shown by the following table,² giving the yearly average prices at Chicago from 1920 to 1929, and also the averages for the entire ten-year period:

Average prices for mutton sheep at Chicago for ten years

Year	Lambs		Yearlings	Sheep		All lambs	All sheep
	Natives	Westerns		Natives	Westerns		
1920	\$14.25	\$14.75	\$12.10	\$8.90	\$9.50	\$14.60	\$9.30
1921	9.20	9.95	7.50	4.50	5.40	9.85	5.10
1922	13.25	13.65	11.15	6.55	7.50	13.55	7.25
1923	13.25	13.60	11.35	6.35	7.40	13.50	7.30
1924	14.05	14.45	11.50	6.90	7.55	14.30	7.30
1925	15.25	15.60	12.20	7.40	8.00	15.50	7.80
1926	13.75	14.05	11.00	6.75	7.15	13.90	6.90
1927	13.80	14.20	11.35	6.55	6.95	13.90	6.80
1928	14.45	14.75	12.15	6.85	7.10	14.60	7.00
1929	14.20	14.45	11.50	6.20	6.40	14.30	6.35
10-yr. ave.	13.55	13.95	11.20	6.70	7.30	13.80	7.10

The above table shows that western lambs outsell native lambs by 40 cents per cwt., and western sheep outsell native sheep by 60 cents per cwt. All lambs together have averaged \$6.70 more per cwt. than all sheep during the ten years from 1920 to 1929 inclusive. Lambs sell \$2.60 higher than yearlings, and yearlings out-

¹ U. S. Bur. An. Indus. Rpt., 1929, p. 33.

² Compiled from Drovers Journal Year Books of Figures.

sell sheep by \$4.10. The inability of thin natives to sell for feeding purposes largely explains the difference in prices between natives and westerns in the mutton class.

Fat lamb prices at Chicago.—The accompanying table¹ shows that prices for fat lambs (including all lambs sold for slaughter except spring lambs) slumped during the latter part of 1920 and continued at relatively low levels during 1921. This was due to inflation of prices during the World War and to severe depression or reaction following the war. Fat lamb prices made a recovery during 1922 and continued strong for eight years, though tending to sag during the latter part of 1929.

Monthly and yearly average prices for fat lambs at Chicago for ten years

	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	Ten year ave.
Jan.	\$16.25	\$13.05	(\$12.55)	\$15.25	\$18.10	\$13.35	\$13.90	\$12.45	\$10.90	\$19.50	\$14.55
Feb.	16.40	15.40	13.00	13.50	17.50	14.70	13.90	14.50	9.20	19.95	14.80
Mar.	16.85	16.15	15.10	13.15	16.20	15.65	13.85	14.40	9.65	18.80	15.00
Apr.	16.80	16.80	15.65	13.65	14.15	16.10	13.30	14.40	9.60	18.80	14.90
May	14.20	16.15	15.15	14.75	(13.60)	15.10	14.15	13.40	11.10	17.40	14.50
June	15.25	16.60	15.45	16.00	14.90	14.65	15.15	(12.15)	11.00	14.25	14.55
July	14.45	15.60	14.35	14.15	15.00	13.85	14.20	12.90	10.30	15.55	14.05
Aug.	13.15	14.55	13.85	14.10	14.80	13.50	13.20	12.55	9.65	13.20	13.25
Sept.	12.75	14.15	13.60	13.75	15.10	(13.30)	13.25	13.45	8.80	13.30	13.15
Oct.	12.60	(13.00)	13.85	13.55	15.20	13.40	12.95	13.80	(8.55)	12.35	(12.90)
Nov.	(12.40)	13.15	13.75	13.00	15.35	13.85	(12.75)	14.10	8.95	11.70	(12.90)
Dec.	12.80	13.90	13.20	(12.40)	16.10	15.75	12.80	14.20	10.80	(11.20)	13.30
Yearly ave.	14.50	14.90	14.10	13.95	15.50	14.45	13.60	13.50	9.90	15.50	14.00

Highest monthly prices are printed in bold-face type. These are scattered throughout the first half of the year. The last column at the right shows that March prices average highest for the ten years.

Lowest monthly prices are enclosed in parenthesis. These are scattered throughout the table, but the ten-year averages show that October and November are the months of lowest average prices. The ten-year averages show a continued rise from November to March, and a continued decline from March to October. Between the March and October average prices for the ten years the difference in price is \$2.10. The monthly averages are illustrated graphically in Fig. 99.

Fat lamb prices as related to supply.—That the price of lambs varies directly in relation to supply is shown in the following chart illustrating the comparison between average monthly prices

¹ Compiled from Drovers Journal Year Books of Figures.

of fat lambs (except spring lambs) and average receipts at Chicago for ten years, 1920 to 1929 inclusive. Receipts include both sheep and lambs, but fully 80 per cent of receipts are lambs and the bulk of receipts sell for slaughter, hence total receipts and mutton lamb prices permit of comparative study.¹ The chart illus-

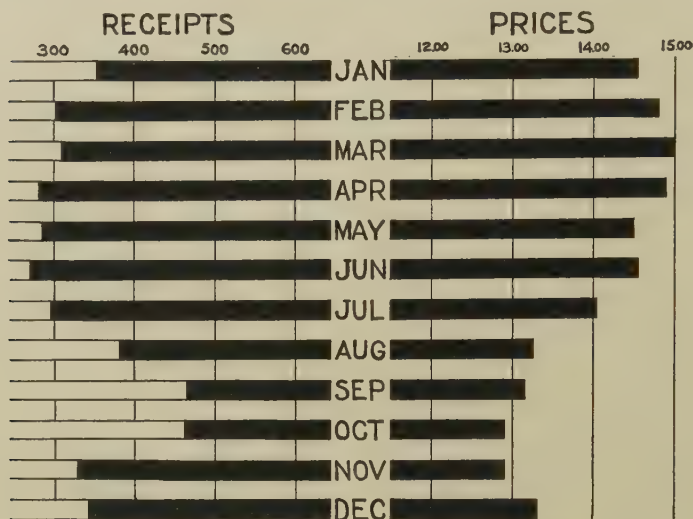


FIG. 99.—Sheep and lamb receipts and fat lamb prices at Chicago. This chart shows average monthly receipts of sheep and lambs in thousands, and monthly average prices of lambs sold for slaughter, except spring lambs, for ten years, 1920-1929. Prices are represented by black bars. Receipts are represented by white bars, but each white bar is prolonged in black to make all of equal length, the longer the black coloring the smaller the average monthly receipts. This brings out graphically the correlation between monthly total receipts and fat lambs prices.

trates the fact that supply and demand rule prices. Demand in this instance is fairly constant, hence supply very largely determines prices. The chart explains to a considerable degree why prices are low in the fall and high in the spring.

¹Figures are not available giving the exact number of lambs received monthly at Chicago or the number sold for slaughter. A similar study of beef steer prices could not be made because beef steers constitute less than half of the total receipts of cattle.

CHAPTER XIX

BREEDING FOR THE MARKET

In Colonial times, sheep were all of the coarse-wool type, brought with the settlers from England and Holland. They were the unimproved original stock from which the present English breeds have sprung. Later, George Washington and other leading agriculturists of the time introduced sheep representing the early breeding improvement in Europe. After the organization of the national government the Merinos made their appearance. In 1860 the Merino was the outstanding feature among American sheep. In 1870 more than four-fifths of American sheep were Merinos or their grades. There were a few middle-wooled sheep and a very few flocks of the long-wooled breeds in the middle states and in the Ohio valley. The old coarse wools were scattered through the South. Kentucky had the largest number of long wools. Importations were made from England and Canada. In Texas and New Mexico were Mexican sheep of Spanish origin that had degenerated and almost reverted to the wild type. Their fleeces were coarse and hairy and weighed only one or two pounds.

When the first exports of beef were made to England, about 1875, the "Scotsman," a Scottish newspaper, sent James Macdonald to America to investigate the American live-stock industry and render a complete report. The results of this investigation were published by Mr. Macdonald in 1878 in a book entitled, "Food From the Far West." His remarks upon the state of the sheep industry in the United States at that time were as follows:

"No one in political or agricultural circles, or elsewhere, seems so confident of the export of mutton becoming or continuing so extensive or so profitable as that of beef. Mutton is not considered an important article of food in America, and the feeding of sheep has received but very little attention from its farmers. Sheep farming is certainly carried on very extensively all over America, especially in the western states of the Union and on the Pacific slopes; but, with a few exceptions in the older and eastern states, the sheep-farmer's whole harvest is his "clip" of wool. There is no demand for mutton, and therefore he prepares none. He keeps a class of sheep specially adapted for producing wool, and allows

his old sheep to die away naturally, or go where they may—that is, if he cannot dispose of them, even for a mere trifle, before they reach the ripe old age of eight or nine years.”

The number of sheep on farms in the United States on census dates grew from 19 million in 1840, to 23 in 1860, 35 in 1880, 36 in 1890, and 62 in 1900, and then declined to 52 in 1910, and to 35 in 1920. The census date was June 1 until 1910, when it was changed to April 15. It was changed to January 1 in 1920.

The number of sheep on farms in the United States on January 1 of the various years, as estimated by the U. S. Department of Agriculture, was 41 million in 1880, 44 in 1890, 42 in 1900, 57 in 1910, 39 in 1920, and 49 in 1930.

There has been a steady increase since 1860 in the proportionate number of mutton sheep. This has been mostly due to the increased demand for meat, and partly to the demand for wools other than the Merino, that is, the combing wools. The flocks of mutton sheep increased in all parts of the country, though Merino improvement was still the predominating feature in sheep husbandry in Vermont, New York, Pennsylvania, Ohio, Michigan, and elsewhere, and the great flocks of the ranges became Merino grades of a high order of merit. In recent years many Merino flocks in the eastern part of the country have been made over into mutton flocks by several succeeding crosses of mutton blood, while on the western ranges increasing numbers of mutton rams have been used for crossing on range flocks to produce a more practical wool-and-mutton type. East of the Missouri river the majority of sheep are of the mutton type, while on western ranges Merino blood predominates.

The following figures reported by the U. S. Department of Agriculture show the leading sheep countries and the number of sheep in each:

Numbers of sheep in leading countries

	Country	Year	Number of sheep
1.	Russia	1928.....	123,810,000
2.	Australia	1929.....	106,000,000
3.	United States	1930.....	48,913,000
4.	Union of South Africa	1928.....	42,662,000
5.	Argentina	1927.....	38,000,000
6.	China	1929.....	35,000,000
7.	New Zealand	1929.....	29,051,000
8.	Great Britain	1929.....	27,630,000
9.	British India	1928.....	23,350,000
10.	Spain	1927.....	20,529,000
11.	Uruguay	1929.....	19,358,000
12.	Persia	1929.....	16,000,000
	World total		633,400,000 ¹

¹ U. S. Dept. Agr. Yearbook, 1930, p. 866.

Mutton production and consumption in the United States is shown in the following table¹ giving the slaughter, imports, exports, and consumption of mutton (including lamb):

Estimated annual production and consumption of dressed lamb and mutton in the United States

Calendar year	Total slaughter	Imports	Exports	Consumption	
				Total	Per capita
	Million pounds	Million pounds	Million pounds	Million pounds	Pounds
1900	517	....	1	516	6.8
1910	599	....	2	596	6.4
1920	532	62	5	590	5.5
1925	599	2	4	597	5.2
1926	643	2	2	642	5.5
1927	645	3	2	645	5.4
1928	671	3	2	673	5.6
1929	699	4	1	703	5.8

During 1920, New Zealand frozen lamb carcasses were imported in large numbers amounting to over one-ninth of the total domestic production of both mutton and lamb. British markets which normally absorb the New Zealand product were overstocked following the World War, and the meat found an outlet in this country.

Our production and consumption of mutton is markedly less than that of pork or beef, and slightly less than that of veal.

The distribution of sheep in the United States is shown by the numbers in the leading states and in the various geographical divisions:

Leading states in numbers of sheep on farms, January 1, 1929²

State	Number	Average value	State	Number	Average value
1. Texas	5,052,000	\$8.90	6. Colorado	2,780,000	\$10.60
2. California	3,846,000	10.80	7. Oregon	2,501,000	11.50
3. Montana	3,761,000	11.30	8. New Mexico .	2,362,000	10.30
4. Wyoming	3,448,000	11.60	9. Idaho	2,216,000	11.90
5. Utah	2,866,000	11.50	10. Ohio	2,154,000	9.00

Distribution of sheep on farms by geographical divisions on January 1, 1929¹

Division	Number
North Atlantic	1,079,000
South Atlantic	1,383,000
North Central, East of Mississippi River.....	5,374,000
North Central, West of Mississippi River.....	5,829,000
South Central	6,784,000
Far Western	26,722,000

Total United States 47,171,000

¹ U. S. Bur. Agr. Econ., Mimeographed Rpt., Statistics of Meat Production, Consumption, and Foreign Trade of the United States, 1900-1929.

² Estimates of the U. S. Department of Agriculture.

The foregoing figures show that the far western division, which includes the range states, has more sheep than all other divisions combined. In addition to the large numbers west of the Missouri river, sheep are densely distributed in central and southeastern Ohio, southwestern Pennsylvania, and southern Michigan, and are rather densely distributed also in northern Kentucky, southern Iowa, and northern Missouri. Ohio and adjoining territory constitute the most important sheep raising section east of the Missouri river.

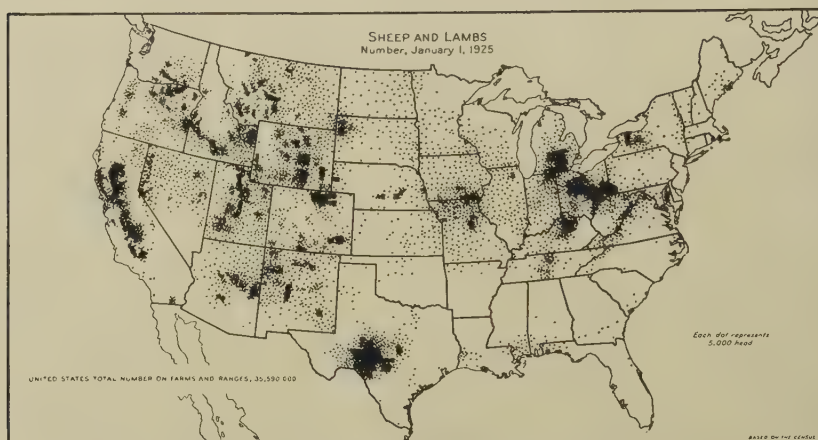


FIG. 100.—Distribution of sheep in the United States. Each dot represents 5,000 head. The dense spots shown in the West are due in part to the date of enumeration, January 1, when many sheep were being fed in the irrigated districts, and in part to the enumeration of sheep in that county in which the owner resides. In summer when western sheep have been moved to mountain ranges they are not concentrated in the small areas as this map indicates.

Centers of production.—The fact that the larger proportion of our sheep are in the West is reflected in the location of the center of sheep production in the United States. According to the 1920 census, the center of sheep production is in the southwest corner of Nebraska. The beef cattle center is in central Kansas, the dairy cattle center is in western Illinois, and the hog center is in north-eastern Missouri. These centers are determined by drawing a line east and west on the map so as to equally divide the total number of sheep or other live stock in the United States. Then a line is drawn north and south, again equally dividing the total number of animals. The intersection of the two lines is called the center of production. The center may or may not fall in a region where a large number of such animals are raised.

Conditions suitable to sheep breeding.—Sheep are rather similar to cattle in their adaptability to range conditions and to improved and cultivated farming sections where there is considerable pasture together with grain and roughage for fattening purposes and for wintering breeding flocks. Mutton and wool production necessitates less grain feeding than beef production, though grain often may be used to advantage, and in some cases grain must be used in order to finish late lambs and those not well nourished by their dams. Many such lambs are brought from the West for fattening in the central states. Sheep differ from cattle in that they are better suited to arid lands and are less suited to wet lands than are cattle. Sheep are best adapted of all domestic animals to very rough lands. Sheep are especially suited with the shorter, sweeter grass of higher altitudes, whereas cattle can best utilize lowland pastures of coarser and ranker growth. That sheep have an important place on high-priced land and in intensive farming is shown by numerous instances in this country, and also by the large numbers of sheep profitably kept under such conditions in Great Britain. Whether on western ranges or on higher-priced lands in the Central West, East, and South, the combined wool-and-mutton type of sheep, yielding annually a good crop of lambs and a good crop of wool, is most profitable. The western sheep owner places more emphasis on the wool, and the sheep owner east of the Missouri river favors the type in which meat production is more marked than wool production, though in both East and West, neither wool nor mutton may be ignored.

Only purebred sires should be used on any flock, and the same breed should be patronized each time a ram is purchased; in other words, breeding for the market should not result in a mixture of breeds, but the owner should breed in line, grading up his flock by consecutive crosses of the same breed. Thus will the good features of that breed be so strongly stamped upon the flock as to give it a high average of individual merit and great uniformity.¹

The number of registered purebred sheep in the United States on January 1, 1920, as reported by the census, was 463,504, or 1.3 per cent of all the sheep in the country.²

Source of improvement.—A certain few men have collected the

¹ For definitions of *purebred* and *grade*, and for discussions of the importance of good ancestry, the utility value of purebred live stock, and the grading process, see Chapter IX.

² The ten leading states in numbers of registered purebred sheep were Idaho 47,107, Ohio 39,444, Oregon 38,738, Utah 30,013, California 28,831, Montana 24,208, Michigan 21,342, Iowa 19,522, New York 18,338, and Texas 17,119.

very choicest purebred and registered sheep that may be had, almost regardless of price, and have established purebred flocks of the highest excellence. The owner of such a flock makes it his business to supply breeding rams and some breeding ewes to breeders of purebred sheep of less prominence than himself. Year after year he slowly improves his flock by careful selection and mating, and he is thus enabled to send out better rams each year to head the flocks of less prominent breeders. In turn, these less prominent flocks supply better breeding animals to more numerous and still less noted breeders, and so the scheme works out, improvement slowly, but surely, flowing downward and outward from a few flocks to the many. There is a third class of breeders who are producing directly for the market. The produce of their flocks goes to market as fat lambs or is sold into other hands for feeding preparatory to slaughter. We may, therefore, classify all flocks of sheep as follows:

1. A few purebred flocks solely for improvement.
2. Numerous purebred flocks primarily for propagation and secondarily for improvement.
3. Many grade flocks solely for mutton and wool production.

The breeders of the third class secure their rams from the second-class flocks, and their ewes are generally grades.

The mutton breeding ram.—The selection of the breeding ram should be most carefully made as he affords the chief opportunity for improvement in the flock. For this reason it is wise to invest several times the average value of the ewes in the purchase of a ram to mate with them. However, it is not so much a matter of securing a ram at a particular price as it is of selecting a sire of merit that is strong in the points wherein the ewe flock is weak, and whose offspring will possess a higher standard of merit than their dams. It is a breeding-up process, and this fact justifies more careful selection and greater expenditure of money in each succeeding purchase of a ram. It is always a matter of locating the sort of ram desired, and the price demanded for him should not stand in the way of a purchase unless it is really exorbitant.

The breeding ram of mutton type must be, first of all, a good mutton animal, including as high development of the form, quality, and fleshing as may be secured. He must, in addition, have a strong, robust constitution as evidenced by a wide, deep chest and middle and good feeding qualities. The story is told of an English shepherd who visited a certain flock to purchase a yearling ram. After much deliberation, he found himself unable to decide among

several of the offerings, all of which suited him. Suddenly his serious expression changed to one of renewed interest, and turning to the owner he said, "Feed 'em." Grain was placed in a trough in full view of the rams, at sight of which one pricked up his ears and marched quickly to the trough, the others following more leisurely. "That's him," said the buyer, pointing to the ram in front, for in common with all experienced feeders he recognized the significance of good feeding qualities. A strong appetite is evidence of constitution, thrift, lustiness, and health, and indicates a disposition to develop quickly and make economical gains.



FIG. 101.—Correct type in the mutton breeding ram. Southdown ram, Babraham Bumper, champion at the English Royal Show. Bred and owned by C. Adeane, Babraham Hall, Cambridge, England. Note the masculine head and neck, blocky body, heavy leg of mutton, and good bone of this ram.

The ram should exhibit strong sexual characters, these being a strong head with distinctly masculine features and expression, a well-developed crest or scrag similar to the crest of the beef bull, a sufficiency of bone, and general ruggedness of build throughout. Style in the ram, including an active gait and bold presence, is an evidence of masculinity and breeding usefulness. Particular attention should be given to the shape, position, and strength of feet, pasterns, and legs. These points should receive attention in any sheep, but in the breeding ram their importance is magnified. The feet should be well formed, the pasterns strong, the bone ample,

and the legs straight. Weakness in the hind legs is of more consequence than weakness in front, as it is more likely to affect the usefulness of the ram as a breeder. The hocks should not be bent so as to give the hind leg a sickled appearance as viewed from the side; and when viewed from the rear, the hind legs should not be bowed outward, but placed straight and square beneath the quarters. Weak or broken-down hind pasterns are particularly objectionable in a breeding ram.

The ram's fleece should be heavy and of good quality according to his breed, special attention being given to the wool in case the ewe flock averages below desired standards for fleece.



FIG. 102.—Correct type in the breeding ewe. Champion Hampshire ewe at the International Show, owned by A. W. Arnold, Galesville, Wis. This ewe has strength and vigor, combined with femininity and quality, and her roomy middle and dense fleece are valuable attributes in the breeding ewe.

So far as the fatness of the ram is concerned, greater satisfaction will ordinarily result from the purchase of a ram in medium condition, or what shepherds call a "field ram," than one that has been much pampered in preparation for sale or show. The latter may present a more attractive form and appearance at the time of purchase, but must be let down in flesh before he can be used for breeding purposes, and it is often true that with loss of fat there are revealed some rather disappointing points in form. This

more often happens when the buyer is a novice and the ram has had the additional advantage of the correcting power of shears in expert hands. In any case, the purchase price of a fitted ram must include the cost of fitting, which may be a considerable amount. It is, of course, a fact that the very choicest rams are highly fitted before being offered for sale, as no flock owner expects to realize full value for an exceptional ram unless he is presented in finished and fitted form; however, this applies to the best offerings and is somewhat outside of the matter under consideration. When rams are purchased to head ordinary flocks the produce of which are sent to market, it will usually be best to pay up to the limit of price for a field ram that suits, rather than invest the same amount in a fitted sheep.

In farm flocks one ram may be used for every 35 to 50 ewes. On the range it is customary to use one ram for every 35 to 40 ewes. A ram lamb should not be used for heavy service. The period of gestation for ewes is somewhat variable but is usually 146 days. Although ewe lambs are sometimes bred in the fall so that they will lamb the next spring at a little over a year old, the usual plan is to allow the ewe lambs to grow and develop into their yearling form, breeding them in the fall to drop their first lambs the following spring at two years old. The breeding of ewe lambs is not ordinarily considered good practice.

The mutton breeding ewe.—Assuming that there is an established ewe flock to which additions are made from the best ewe lambs of each year, the problem of the breeder is to weed out the less desirable ewes and send them to the butcher. Herein lies a second advantage from the use of good males, for if the sire proves a successful breeder, the owner is furnished with excellent material with which to replenish his ewe flock, thus permitting closer culling of the aged ewes than would be possible had an inferior ram been used. Hence the use of a good ram not only results in direct improvement in the first crop of lambs, but there is the added advantage of the improvement which is realized when the best ewe lambs reach breeding age.

It is easiest to cull the flock a short time after shearing, allowing a few days to elapse in order that the ewes may recover from the shabby appearance and somewhat disorganized state common to many of them immediately after being shorn. Aged ewes and broken-mouthed ewes should have been weeded out the previous fall, the cost of wintering them being a needless expense inasmuch as they are difficult to winter without becoming very low in flesh.

The wintered ewes may then be sorted two or three weeks after shearing; faulty forms and lack of size are easily detected at that time. It is an easy matter to part with ewes that are aged, broken in mouth, ruptured, crippled, or defective in udder, but it sometimes requires strong determination to give up ewes that are sound, but nevertheless unworthy because of faults in form, quality, size, or fleece. This is especially true when close culling will not leave as large a flock as it is desired to carry, but in the long run it will be best to err on the side of too close culling rather than to carry certain individuals that do not measure up to desired standards. Form, size, quality, constitution, muscling, and smoothness of outline should receive much consideration, the requirements



FIG. 103.—A prize winning flock. First prize Shropshire flock at the International, owned by A. Broughton and Sons, Albany, Wis.

for which have been set forth in preceding chapters. One word more, however, may well be added on heads and necks. The following by John Wrightson of the Royal College of Science, London, England, is much to the point:¹

“Nothing looks better than good heads, and, strange as it may seem, a sheep’s head, which is only worth 9d. (18 cents) at the butcher’s is worth a lot of money when carried on a good ram or ewe. A muscular neck indicates strength of constitution and good muscular development, and I have never known a sheep breeder who did not strongly object to a shabby neck. Mr. Ellman, the father of the Southdown breed, insisted on the importance of this point. Mr. James Rawlence, of Bulbridge, one of the oldest of our noted breeders, would not keep a weak-necked ewe, and no man

¹ Sheep, Breeds and Management, London, 1908, p. 126.

who values his flock would buy a ram with this fault. The neck ought to be muscular, arched, tapering, and neat."

Uniformity in shape, size, color markings, and general appearance is a valuable attribute in any flock. When the produce is intended for the open market, this insures a uniform lot of lambs for feeding, and it adds much to the attractiveness of the finished lot when presented to the buyer.

The breeder who aims to supply the open market must emphasize the matter of wool when building up a breeding flock. Although meat production is the principal object in view, the clip of



FIG. 104.—A flock of uniform type.

wool from such a flock ought to be an important source of revenue. Furthermore, the ewe with the heavy fleece is better protected from the weather, remains more healthy for that reason, and the density of her fleece keeps it freer from dirt, manure, chaff, and other foreign matter. Moisture is better excluded and the yolk thus becomes abundant, protecting the fibers and preventing a cotted fleece. Her offspring, being heavily wooled, is less subject to chills and colds which hinder rapid growth and development. And lastly, the heavy fleece finds an appreciation on the live-stock market. All along the line, therefore, from breeding flock to packing house, the fleece with density, length of staple, and quality meets with approval and increases the value of the animal it covers.

It is evident that it takes years to build up a flock of much uni-

form merit and value. It is not a difficult matter to stock a farm with sheep, but whether or not the undertaking will be successful depends very largely upon the wisdom displayed in the culling of ewes, selection of rams, and the general management of the flock. In no other kind of live stock does the individuality of the man in charge display itself so strongly as with sheep. Sheep respond quickly to good care, and deteriorate rapidly when neglected.

Although some essential points in flock management have necessarily been touched upon in discussing the elements that constitute a good breeding ram and breeding ewe, nevertheless a detailed discussion of sheep management cannot be presented here, as it would require much space and is outside the range of the general subject in hand. However, such important subjects as winter management and feeding of ewes, feeding as a factor in getting ewes in lamb, dipping, management at lambing time, feeding and management of ewes and lambs, docking and castrating, the feeding of lambs, shearing, control of internal parasites, the sheep-killing dog, crops to grow for sheep—these and many other subjects relating to sheep feeding and management should be carefully studied by anyone who contemplates entering the sheep business.

CHAPTER XX

THE MERINO OR FINE-WOOL TYPE

All sheep are wool bearing, but the Merino excels in weight and fineness of fleece. The Merino is the foundation of American sheep husbandry. It is the most important sheep in America today, though less so than formerly. By far the greater number of grade flocks, especially in one section centering in Ohio, and another comprising the territory west of the Missouri river, are of fine-wool origin. Of the 47,171,000 sheep in the United States, 26,722,000 are in the western division, and these are largely of Merino breeding. Many western sheep are brought into the corn belt for fattening.

The Merino is native to Spain, and from the Spanish Merino have come all present breeds of Merino sheep. This stock existed in Spain prior to the Christian era, but in all its history in Spain there is practically no record of attempts at improvement. In the eighteenth century, Spanish Merinos were taken to Saxony, France, United States, South Africa, Australia, and other countries in which distinct types and breeds have been developed by selection from the old Spanish stock. Over 20,000 Merino sheep were imported into the United States prior to 1811, and these formed the foundation of the breed known as the American Merino. Beginning in 1840, importations of the French Merino or Rambouillet were made to America, and this breed is now bred extensively to supply rams for western flocks.

The American Merino is the outcome of efforts to develop a sheep with a fleece of the greatest possible value. Some breeders carried their efforts so far as to ignore the meat-producing qualities of the animals they bred, centering practically all their attention on the fleece. At best, the improvement of any kind of live stock is a difficult and slow undertaking. When improvement is sought in one or a few respects, the desired results are secured more readily and in greater perfection than when an attempt is made to improve the animal in a rather large number of ways. It is still more difficult to improve a breed of live stock along two or more opposing or antagonistic lines, such as beef and milk, mutton and wool, strength and speed, or size and quality. It was for this reason that many breeders of Merino sheep in America willingly sacrificed the meat-producing qualities of their flocks in order that

the production of wool might be made as large as possible. These breeders developed what was formerly known as the Vermont Merino, a type that contrasts with mutton type as strongly as dairy cattle contrast with beef cattle.

Other breeders of fine-wool sheep did not entirely ignore the mutton qualities of their animals, but placed some emphasis upon a good conformation and a reasonable degree of fleshing; at the same time they gave most attention to the weight and quality of fleece. Efforts of this kind in America resulted in the creation of what is known as the Delaine type of the American Merino; in France similar efforts resulted in the breed known as the French Merino or Rambouillet. Thus a type was established having better mutton qualities, a smoother skin, a fleece of greater length and



FIG. 105.—Class A Merino ram.

uniformity, and a type that is shorn much more easily because of its freedom from wrinkles. Broadly speaking, however, the differences mentioned in the ideals of breeders of fine-wool sheep have not resulted in enough variation in type to prevent a satisfactory study of fine-wool sheep as a single group or type.

The **general appearance** of the fine-wool sheep is very distinctive. In a general way, the conformation resembles that of the dairy cow. There is the same narrowness of forequarters and mod-

erate width of back and body, the same muscular rather than fleshy covering, and the same tendency to be somewhat rangy of body and long of leg. As compared with the mutton type, there is proportionately more length and narrowness of head, more length and thinness of neck, less arch of rib, and less development of thigh and twist. These differences are marked, so that shorn of their fleeces, the two types of sheep present striking differences in form. When viewed in the wool, further variations are manifest. The fleece of the fine-wool sheep is more compact and is often very dark in color, the latter being due to the very heavy secretion of yolk which catches dust and dirt and produces a black gum on the exterior of the fleece. The mutton-type sheep has a smooth skin, but the fine-wool type has a loose skin lying more or less in folds or wrinkles. Sometimes there are only a few folds about the breast and lower border of the neck, while the middle and hindquarters are smooth; but some fine-wool sheep present a very wrinkled appearance over the entire body.

The **head** should be rather short, medium wide, and well defined or clean-cut in its features. The muzzle should be broad and the nostrils should be large. Rams should have a Roman nose with more width than ewes. The eyes of both sexes should be rather wide apart, large, and clear, and have a quiet expression. The forehead should be somewhat prominent and have a fair degree of width. The ears should be fine, short, covered with silky hair, and actively carried. The horns of the ram should be placed rather well apart so as to give width and strength to the top of the head. At maturity the horns attain a strong development. They have a corkscrew shape, turning backward from the base, then downward, around forward, and up, making about one and one-half turns. The ewes are hornless. Wool covers the poll, forehead, upper part of the face, and cheeks, while the ears and lower part of the face are covered with white hair, which should be very soft and fine. The skin about the nose is often wrinkled. The head of the ram should be very masculine as shown by heavy horns, wide poll, Roman profile, and heavy nose, all parts being well developed or massive and the expression resolute. The ewe should have a refined head and a feminine expression.

The **neck** should be moderately short and rather muscular. The neck and shoulders do not blend smoothly as in the mutton type, although extreme angularity or roughness is undesirable. Males should show a heavily muscled neck; a pronounced crest or scrag just behind the poll indicates a strongly sexed animal.

The **shoulders** should be well laid in, and should be muscular. The depth of fleshing is not great enough to give that smoothness of form which characterizes a good mutton-type animal. The tops of the shoulders are often sharp and high, especially in those individuals showing the more extreme development of the type; but a neat, rather rounded conformation with a fair degree of smoothness is more to be desired, especially in rams.

The **breast** should be deep and have moderate width. The absence of heavy fleshing makes impossible the development of any



FIG. 106.—Class B Merino ram.

marked degree of plumpness or width, yet a very narrow or peaked breast indicates a cramped chest cavity and lack of strong constitution.

The **chest** gets its capacity from depth more than from width. Extreme narrowness is a serious fault; the fore-rib should arch sufficiently and carry down far enough to provide a roomy chest. The fore flank should be reasonably well filled out. Every type of animal needs a robust constitution, one of the best evidences of which is a large heart-girth, proper allowance being made, when judging, for the thickness of fleshing which covers the fore-quarters.

The **front legs** are often very crooked at the knees, too close

together, and too long. They should be reasonably straight, moderately wide apart, and fairly short. The feet are often poorly formed and rather weak, whereas they should be well developed and strong. The shanks should be reasonably fine and rather short, and the pasterns should be free from weakness.

The **back** and **loin** vary somewhat according to the ideals of breeders. In the very wrinkly Merinos in which the mutton qualities are ignored, the top is noticeably long and narrow, and this may be carried to an undesirable extreme. In the Delaine Merino and Rambouillet, the back is proportionately shorter and wider. In any case the top should be straight from shoulders to hips, showing a fair degree of width of back and a rather wide, strongly muscled loin.

The **ribs** should be fairly well arched and should show good length in order to provide proper feeding, breeding, and chest capacity. The middle is not very compact, but is moderately long.

The **hips** are somewhat prominent on account of their width and the lack of deep fleshing throughout, but ragged hips are undesirable. Much smoothness cannot be expected in a Merino, yet a rather neat, tidy conformation is demanded.

The **rump** is often peaked and drooping, but the best form embodies a rump that is long, level, and medium wide.

The **thighs** and **twist** vary with respect to the class of fine-wool sheep under consideration. Generally speaking, the thigh should be medium thick, and the muscling between the legs should be sufficient to afford at least a moderate development of the twist.

The **hind legs** should be straight, medium long, reasonably fine, strong in pastern, and placed somewhat apart. A large percentage of Merino sheep have crooked hind legs, the hocks being close together and the feet too wide apart, or the hocks much bent so as to place the hind feet too far under the body, instead of carrying straight downward from hock to ground. The feet should be well formed and strong.

The **skin** should have a bright pink color, indicating health. Fine-wool sheep usually show an excellent color of skin superior to the mutton type. As already mentioned, the skin is more or less folded or wrinkled. The Merino has not only a thinner skin than the mutton breeds, but is more richly furnished with oil glands and secretes a great deal more yolk. Fineness of skin and fineness of wool are correlated characters.

The **quality** of fine-wool sheep is evidenced by fineness of fleece.

fineness of bone, fineness of hair on face and ears, and by a medium-sized, clean-cut head with fine ears.

The style of the fine-wool type is usually rather marked. Merinos have good carriage of head and ear and are quick and active in their movements, walking rapidly and covering ground with more ease and speed than the mutton-type sheep. Their greater activity partly explains their popularity on western ranges where Merino blood forms the basis of most flocks.

The fleece of the Merino has a very high degree of fineness, varying, however, in different flocks and in different individuals. The skin has many more fibers to the square inch than any of the



FIG. 107.—Class C Merino ram.

mutton breeds; in other words, the fleece is ordinarily very compact and dense. Density and fineness are outstanding features in a good fine-wool fleece, the crimp being very fine and regular from skin to tip of fiber. The very finest woollen fabrics are made from this wool. A third striking feature of the Merino fleece as compared with mutton sheep is the large amount of oil or yolk it contains. This gives a generous coating to each fiber so as to preserve its soundness and pliancy. Merino wool commonly undergoes a shrinkage of 65 per cent in scouring, and this figure is not infrequently exceeded. When the secretion of yolk is very excessive,

the fleece is made subject to criticism and the wool buyer makes allowance for the extra weight in the price he offers.

The wool should cover the head in the fashion already described, only the nose and ears being bare. The fleece should cover all of the body and extend down the legs to the feet. The belly and under parts vary a great deal in the covering of wool. It is important that the belly be well wooled, and that the natural bareness occurring at the armpits be as limited in area as possible. The scrotum of the ram should be covered with wool. The wool on the under parts of the animal should be as nearly like the rest of the fleece in density and length as possible. The length of fiber in a



FIG. 108.—Class B Merino ewe.

year's growth of fleece should be $2\frac{1}{2}$ inches or over. A good Merino flock should average 11 to 15 pounds of wool.

Classification of fine-wool sheep.—Breeder of fine-wool sheep and the larger sheep shows group or classify American Merinos into three classes or sub-types, known respectively as A, B, and C. As already pointed out, breeders of Merinos have differed in their ideals for a number of years, and this has resulted in three fairly well-defined classes. The classification is based chiefly on the character of the fleece, the number and position of the folds or wrinkles,

the size and weight of the animal, and the development of mutton qualities.

Class A.—These are the smallest and most wrinkly of the three classes, and have the finest, densest, and heaviest fleeces, the shortest wool, the most yolk, the poorest mutton qualities, and the poorest form. Rams weigh about 140 pounds, fleece off; and ewes about 100 pounds. There are heavy folds all over the sheep, except over the back. A good ram should shear close to 30 pounds, and a ewe about 20 pounds. These weights for fleeces represent high standards. The length of fiber is from 1½ to 2½ inches. The



FIG. 109.—Champion Rambouillet ram at the 1928 International. Owned by King Brothers' Company, Laramie, Wyo.

wool shrinks about 70 per cent on the average when scoured. The form of the A Merino is most narrow, rangy, leggy, and irregular in lines of the three classes, and mutton qualities are practically wanting. It is entirely a wool proposition, with weight of fleece esteemed above everything else. The wrinkly skin results in considerable variation between the wool on top of the wrinkles and that between. The wool on the tops of the wrinkles, being opened out and more exposed, is much less oily, considerably coarser, and slightly shorter.

Class B.—This class is wrinkled on the neck, breast, flanks, and about the dock. It has better mutton qualities and better form than A. Rams weigh 150 to 175 pounds; ewes, 100 to 115 pounds, fleece off. Strictly good rams of this class should shear 25 pounds, and ewes 15 pounds. The fiber measures from $2\frac{1}{2}$ to 3 inches, and the wool shrinks about 65 per cent. It sells at a somewhat higher price per pound than the wool of A.

Class C.—This is also called the Delaine class. These sheep are free from folds, unless to a slight extent on the neck and breast. The head, legs, and body are not so well woolled as A and B. It is



FIG. 110.—Champion Rambouillet ewe at the 1928 International. Owned by Bullard Brothers, Woodland, Cal.

the largest of the three classes, has the best form, being more blocky and low set, and has the best mutton qualities. It is a creditable meat producer, but not equal to the mutton breeds. The ram should weigh about 175 pounds, and the ewe about 125 pounds, fleece off. Rams should shear 18 pounds, ewes 11 pounds. The fleece has less crimp and fineness and less density than the fleece of A or B, but is longer, measuring from 3 to 4 inches. The wool shrinks about 60 per cent, and sells at a somewhat higher price per pound than B.

The Rambouillet breed, developed in France, excels all other

Merinos in size, constitution, and mutton qualities. The ram should weigh 185 pounds or over, and the ewe 155 pounds or over. Some of them are very large, rams weighing up to 300 pounds and over, and ewes up to 250 pounds. They have strong frames, heavier bone than the American Merinos, considerable length of leg, and the top line is usually straighter than the American Merino. The head has a bold appearance, is carried higher, and has a more complete covering of wool. The Rambouillet has a smooth body with only a few large folds over the breast, and possibly a few light folds at the flanks and dock. Rams should shear from 15 to 20 pounds, and ewes 10 to 12 pounds. These figures are surpassed by the very best of the breed. The weight of fleece averages less than that of the American Merino, mainly because of less oil or yolk. The length of fiber should be from $2\frac{1}{2}$ to 3 inches, although much of it falls short of this length. The wool has great fineness, but not quite equal to that of the American Merino.

CHAPTER XXI

WOOLS AND WOOL GROWING

No animal has a covering entirely of wool; even sheep have hair upon the face and lower parts of the legs. Wool ranks next to cotton as a source of textile fabrics, the temperate regions universally using woollen products. The per capita consumption of wool has increased very greatly. It was about 3 pounds in early times in the United States when all spinning and weaving was done in the home; in 1850 it was 4 pounds; it is now about 6½ pounds. No other people use as much wool as do Americans, nor as much cotton. The world's clip of wool averages about 2 pounds for each person.

As a rule, sheep are shorn only once a year. The coming of mild weather in the spring marks the time of shearing. Both hand and machine shearing are practiced, preferably the latter. As the wool is sheared off it is usually kept in one piece so far as possible,

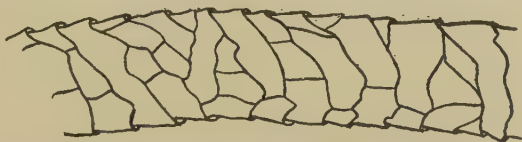


FIG. 111.—Wool fiber highly magnified. This drawing shows the scaly surface of the wool fiber; the tips of the overlapping scales project outward and point toward the tip of the fiber.

and as soon as the fleece is removed it is spread out, with the flesh or cut side down, any loose pieces are thrown into the center, and the fleece is then rolled up with the flesh side out and is tied with twine. Prior to shipment the fleeces are packed in large sacks, in which condition they arrive at the various wool markets of the country.

Growth and structure.—Wool is modified hair. The term hair is ordinarily used to designate a smooth, straight fiber or filament like horse hair. Wool differs from hair in being more or less crimped and in having a much more serrated or ridged surface. The surface of the fiber is composed of a single layer of irregular, overlapping scales, apparent only under the microscope, forming the wool cuticle, there being from 1,200 to 3,000 exposed points of these scales to an inch. The scales open or point toward the tip of the fiber, like shingles put on the wrong way. Beneath the cov-

ering of scales is the cortex or body of the fiber, made up of greatly elongated cells united into bundles, and in the center of the fiber there is sometimes a cavity or canal which may contain granules of pigment.

Hair and wool are very similar in growth and structure, but wool is crimped, has more scales, the points of the scales are more open or projecting, and the entire fiber is more soft and flexible than hair. These small differences give to wool its special commercial values. Hair will not retain the twisted state given to it in spinning, but the crimp of wool causes the fibers to become entangled, and the minute scales hook together and hold the fibers in position when wool is spun into yarn. Thus wool has a thread-forming quality which hair has not, preventing slipping and separation of

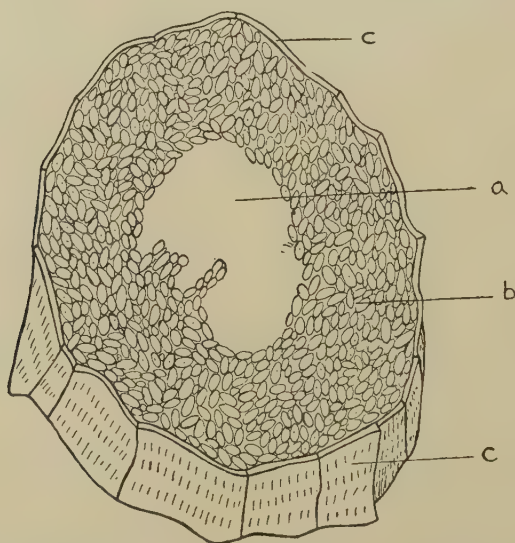


FIG. 112.—Cross-section of a wool fiber. a, Central canal, which is not present in most wools; b, cortex or body of fiber, composed of long, spindle-shaped cells which here appear oval because they are cut transversely; c, wool cuticle, composed of scales.

the fibers in the yarn. The entanglement and locking of the fibers is referred to as the “felting quality” of wool.

In Merino wool, the scales or projections are very distinct and sharply pointed. In the medium-wool breeds, the scales are less distinct and sharp, and in the long-wool breeds, they are rounded off and indistinct. In Merino wool, about 2,400 of these scale-ends are found to the inch; in the Southdown there are 2,000 to 2,080; and in the Leicester, 1,850 to 1,860. Merino wool is superior in

felting quality, the others standing in a relation proportional to the figures given.

Fineness of fiber.—Dr. William McMurtrie, who conducted extensive investigations of wools for the U. S. Department of Agriculture,¹ found the average diameter of the Merino fiber to be $1/1,194$ of an inch, while the Southdown had an average diameter of $1/865$, the Hampshire $1/769$, the Lincoln $1/685$, the Leicester $1/654$, the Cotswold $1/605$, and the Oxford Down $1/581$. In 1860, American Merino fibers with a diameter of $1/1,572$, and American Saxon Merino fibers measuring $1/1,875$ of an inch in diameter were exhibited in London, showing the extreme fineness which may be secured in wools.

Secretion and composition of yolk.—Opening into each wool follicle are a couple of sebaceous or oil glands, furnishing a profuse secretion of an oily or fatty material, called the yolk, which is thrown out at the same time the fiber is formed. This secretion consists largely of a soapy matter having a potassium base, together with an animal oil which gives to the yolk its peculiar odor. Yolk, then, is not strictly a grease or oil, but is a soap with an excess of oil. This explains why it dissolves freely in warm water and may be washed almost entirely out of the fleece, and why it cleanses and whitens the hands as soap does. The quantity and fluidity of the yolk vary greatly, being greater when the sheep are healthy and well fed, and varying also according to the breed. The yolk maintains the softness and pliancy of the fibers, and protects the scaly surface from injury such as might result from friction of the fibers against one another during the movements of the animal. It also helps to keep the fleece clean and free from a cotted or matted condition. The wool manufacturer removes the grease from wool by the scouring process. This is the first step in wool manufacture.

Woolens and worsteds.—When scoured wool is combed, that is, drawn through metal teeth, the fibers are made to lie parallel to each other and foreign matter and short fibers are combed out. This waste is called the “noils,” and the remaining long fibers are called the “top.” Wool used for combing under the Bradford or English system of manufacture must be strong and at least $2\frac{1}{2}$ inches long in order to give the yarn sufficient strength. Such wool is called *combing wool*. The yarn made from combed wool (top) is called *worsted*, and the cloths made of it are known as *worsteds*.

Wools which are short and much crimped and serrated are

¹ U. S. Dept. Agr. Rpt., Examination of Wools and Other Animal Fibers.

called *clothing or carding wools*. They have a high felting quality. In preparation for spinning they are put through carding machines which jumble the fibers together in any and every direction, forming a mixed mass from which the yarn is eventually drawn. The cloths made from such yarn are known as *woolens*.

The difference between woolens and worsteds is largely due to the way the yarn for each is spun. In worsted yarn the fibers are arranged as parallel as possible by the combing process; in woolen yarn they are crossed in every direction so as to assist the felting or milling of the cloth. Yarn for woolen cloth is very slightly twisted, so as to leave the fibers as free as possible for the felting process; worsted yarn, on the contrary, is hard spun and made into a much stronger thread. By the process of manufacture, woolens are felted so as to leave little or no appearance of the thread, while in worsteds, the threads are plainly evident. Woolens usually have a fuzzy, downy surface, while worsteds have a smooth, hard finish. Worsteds hold their shape better than woolens.

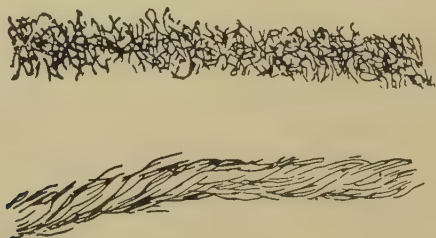


FIG. 113.—Woolen and worsted yarns. In the woolen yarn (upper) the short wool fibers are crossed in every direction, while in the worsted yarn (lower) the fibers are longer and are laid parallel to each other.

Worsted cloths have a more clearly defined pattern and more firmly woven appearance than woolens. Woolen cloths are softer and the various colors are not so distinct in the cloth.¹ The principal worsted cloth is Serge, while woolens include several leading varieties such as Tweeds, Cheviots, and Broadcloths. The manufacture of woolen underwear is also essentially a woolen process.

Shoddy, obtained by tearing up woolen rags by machinery, now enters into the composition of all except the very finest woolen yarns, but cannot be used in the manufacture of worsted yarn under the Bradford or English system. However, a varying proportion of cotton threads are often woven into worsted cloth.

¹ Men's suits are usually made from worsted cloth, except that the under part of the collar is lined with woolen cloth. This is mentioned so that the reader, at least the male reader, may readily find samples of the two classes of fabrics in order to note the distinctions mentioned above.

Worstededs may be dyed in the top, the yarn, or the cloth. Woolens may be dyed in the wool, the yarn, or the cloth.

Pounds of wool per pound of cloth.—For woolen goods, from 3 to 4.64 pounds of grease wool, with an average of 3.73 pounds, are required to make 1 pound of cloth. The average amount of scoured wool required is 1.37 pounds. For worsted cloths, from 2.56 pounds to 4.55 pounds of grease wool are required, with an average of 3.66 pounds. The average amount of scoured wool for 1 pound of worsted cloth is 1.55 pounds.¹

Classification of wools.—Wools may be classified according to their origin and also according to their value and adaptability for different uses. The classifications in common use in this country are as follows:

Clipped wools and pulled wools.—The first distinction made in wools is to divide them into fleece or clipped wools and pulled wools. The former are the ordinary clipped wools coming to market in separate fleeces. These are the more valuable and constitute by far the greater portion of the wool of commerce. Pulled wools are those derived from the pelts of slaughtered sheep in the manner described later on. They are marketed in 500-pound bales. Pulled wools constitute about one-seventh of all the wool produced in the United States.

Domestic, territory, and carpet wools.—Domestic wools are wools coming from the small farm flocks east of the Missouri river. For the most part, the sheep are of mutton type and breeding. As compared to territory wools, these wools are usually clean and bright, due to the better protection and care given the sheep. Territory wools are those produced west of the Missouri river, and they derive their name from the fact that this section was formerly made up of Territories in distinction to the States of the central and eastern sections. Territory wools are produced by the large flocks of range sheep which contain much fine-wool breeding, though the use of medium- and long-wool mutton rams is increasing. They shrink from 60 to 70 per cent on the average when scoured, and sometimes over 80 per cent, due to the presence in fleeces of sand, dirt, and considerable yolk. Carpet wools are inferior and low-priced wools containing much kemp or dead fibers, and are used in the manufacture of carpets and coarse blankets. Very little carpet wool is produced in this country.

Domestic wools may be subdivided into two groups or sub-

¹ F. R. Marshall and L. L. Heller: *The Woolgrower and the Wool Trade*, U. S. Dept. Agr. Bul. 206, p. 24.

classes, known as "bright" and "semi-bright," depending on the whiteness and luster of the fiber. Bright wool is produced by Ohio, Pennsylvania, New York, West Virginia, Kentucky, Indiana, Illinois, Iowa, Michigan, Wisconsin, and Minnesota. Semi-bright wool comes from the Dakotas, western Kansas, and Nebraska. They are midway between the bright and the territory in condition, having more sand and dirt than the bright but not as much as the territory. The best bright wools are those known as "Ohio" wools, produced not only in Ohio but also in Pennsylvania and West Virginia.



FIG. 114.—Clothing and combing wools.

More than half of the flocks of this region are of Merino breeding. Ohio wool is famous for strength, cleanliness, and general quality, and commands a premium on the market.

The states which produce territory wool are Montana, Wyoming, Idaho, Utah, Nevada, Colorado, and Washington. These are mainly range states. Sand storms deposit much sand and dirt in the fleeces. When the range is bare of snow in winter the wool often shrinks 5 per cent more than when the ground has been covered. Because of the varying shrinkage of territory wools, they are sold on the market upon a clean or scoured basis.

The clips of California, Oregon, Texas, Arizona, and New

Mexico are no longer classed as territory wools due to the fact that they have rather distinct characteristics. In Texas, shearing is often practiced twice a year, in which case the wool comes to market untied. In California, the northern counties shear once a year, but the middle and southern counties often shear twice a year, the wool shrinks more than that of the northern counties, and it comes to market untied. Oregon produces some excellent wool, though somewhat high in shrinkage. This state also produces what are known as "valley wools," largely from long-wool sheep. New Mexico and Arizona wools are very uneven in character and often kempy, due to lack of care of the sheep and inferior breeding. They come to market untied and are poorly put up.

Washed, unmerchantable, and unwashed.—Formerly the practice of washing sheep just prior to shearing was extensively followed in the eastern states. This gave rise to the terms *washed*, *unmerchantable*, and *unwashed*. Unmerchantable wool is not unsaleable wool, but that which has been poorly washed. Fleeces may be unmerchantable for other reasons. The practice of washing is almost a thing of the past, and the use of these terms does not necessarily imply that the washing operation has actually taken place, but sometimes refers solely to shrinkage. Washed wools are lighter in color and condition, shrinking 3 or 4 per cent less than unmerchantable, and the latter shrinks about 3 or 4 per cent less than the unwashed.

Market classes and grades of wool.—Most American-grown wool is sacked just as the fleeces come from the sheep and is sold at home to dealers or is consigned to a commission agency. Before offering the wool to the manufacturer the dealer or commission agency opens the sacks and makes up from the various purchases or consignments a number of piles, each containing only fleeces of similar character and value. This is called grading, and it is performed without untying the fleeces.

The first division which the market makes in wools is to divide them into the Domestic and Territory classes. The advantages of domestic over territory wool have been mentioned. Each of these is again divided into the Combing and Clothing classes. Combing wool is usually worth about 10 per cent more than the short or clothing wool, and the aim of the wool-grower is to produce combing wool. Each class is divided into grades, and in grading fleeces the main factor is fineness of fiber, although other factors such as length, shrinkage, and general character are considered. The various grades are adapted to the manufacture of different kinds of fabrics.

Thus the wool dealer is enabled to supply the manufacturer not merely a certain general class such as combing wool or clothing wool, but a particular kind or grade of fleeces within that class specially adapted to his mill. The complete classification may be represented in outline as follows:

DOMESTIC WOOLS

<i>Combing wools</i>		<i>Clothing wools</i>	
Delaine	<i>{</i> Fine Medium <i>}</i>	XX and X, washed or fine unwashed	<i>}</i> often one grade
Half-blood		Half-blood clothing	
Three-eighths-blood		Three-eighths blood clothing	
Quarter-blood		Quarter-blood clothing	
Low quarter-blood			
Braid			

TERRITORY WOOLS

<i>Combing wools</i>		<i>Clothing wools</i>	
Fine staple	<i>{</i> usually one grade	Fine clothing	<i>}</i> usually one grade
Fine medium staple		Fine medium clothing	
Half-blood staple		Half-blood clothing	
Three-eighths-blood staple		Three-eighths blood clothing	
Quarter-blood staple		Quarter-blood clothing, or short	
Low quarter-blood staple		quarter-blood	
Coarse, common, low, or braid	<i>}</i> often one grade		

As previously explained, combing wools are at least $2\frac{1}{2}$ inches long without stretching, while clothing wools are all under that length. It will be noticed that much the same names are given to the grades within each class. The term "staple" as applied to territory wools means the same as the term "combing wool."

If a Merino sheep east of the Missouri river grows a fleece that measures at least $2\frac{1}{2}$ inches long without stretching, it grades as Delaine on the wool market. The same sheep west of the river grows a fleece that grades as Fine Staple or Fine Medium Staple. The Fine Staple or Fine Medium Staple fleece has a greater shrinkage than the Delaine fleece. This is the main distinction between the two. When scoured, the wools have much the same value. The eastern wool may be somewhat stronger, but in a general way the wool is the same in both fleeces.

If a Merino sheep in the East grows a fleece less than $2\frac{1}{2}$ inches long, it grades as XX or X, or as Fine Unwashed. Market usage has decreed that XX and X as grade names shall be used only in referring to washed clothing wools. XX is a somewhat finer wool than X. Fine Unwashed corresponds to XX and X, but shrinks more in scouring. The same sheep in the West grows a fleece that grades as Fine Clothing or Fine Medium Clothing. Fine Clothing corresponds to XX, and Fine Medium Clothing corresponds to X, except that the territory wool shrinks more than the domestic.

Similar comparisons might be made for the half-blood grade, the three-eighths-blood grade, etc. If we substitute the general term "Fine" for all the grades thus far discussed, we may say that each class of wool has the following grades:

- | | |
|------------------------|-----------------------------------|
| 1. Fine | 4. Quarter-blood |
| 2. Half-blood | 5. Low quarter-blood |
| 3. Three-eighths-blood | 6. Low, coarse, common, or braid. |

In the early days of the American wool trade, the half-blood, three-eighths-blood, and quarter-blood grades referred supposedly



FIG. 115.—Grades of combing wool. Fine combing at left and half-blood combing at right.

to wools from sheep of half, three-eighths, and quarter Merino blood, but they have no such significance now. Wools grading as high as half-blood can come from sheep having no trace of Merino blood. On the other hand, quarter-blood would rarely come from a sheep containing any Merino blood. Low quarter-blood is a grade lower than quarter-blood, and braid is the lowest grade of all. It usually refers to luster wool such as might come from a Lincoln or

Cotswold sheep. The grading of wool in the wool houses is done by expert graders who know wools so well that at a glance they can determine the grade to which the wool belongs. Many of these wool graders may never have seen a sheep in the fleece, neither do they know the breeds of sheep and the characteristic fleeces. Hence, the



FIG. 116.—Grades of combing wool. Three-eighths-blood combing at left and quarter-blood combing at right.

wool grade does not depend upon the breed of sheep, and the wool from different individuals of the same flock and breed may be graded differently. Wool, then, is graded on the market according to its merit, regardless of the breeding of the sheep which grew it, although some of the names of the various grades may seem to indicate the breeding of the sheep.

Half-blood wool approaches fineness, but is not so finely crimped as the fine grade. It is also somewhat longer in its class, and usually shrinks less in its class. Three-eighths-blood has a



FIG. 117.—Grades of combing wool. Low quarter-blood combing at right and braid wool at left.

tendency toward the coarser wool. It is less crimped than half-blood and less elastic. It also shrinks less when scoured because it is less oily as a rule. Quarter-blood represents the next step down the scale in fineness and crimp, with still less shrinkage. It is longer than three-eighths-blood. Practically all three-eighths-blood and quarter-blood wools are of combing length. Braid wool varies from 4½ inches up to 12 or 13 inches in length. Its name comes from the fact that it is particularly suitable for the manufacture of braids. It is generally used, however, in fabrics requiring long and coarse fibers. For bunting or flags there is no other wool its equal. Because of its length and coarseness it does not appear as one of the grades of clothing wool.

The foregoing statements regarding the comparative lengths and shrinkages of the various grades of wool may be illustrated by the following table ¹ giving the most acceptable length and the estimated average shrinkage of each grade of Montana combing wools:

Grade	Acceptable length for an average grade— inches	Shrinkage— per cent
Fine and Fine medium	2½	64-65
Half-blood	2¾	61-62
Three-eighths-blood	3¼	55-57
Quarter-blood	4	51-53
Braid	4½-13	46-48

Classes and grades of wool from various breeds of sheep.—The following list ² shows in a general way how wool from the various breeds would be likely to grade. This table is presented because it will be of interest and because it will assist the reader who knows the fleeces characteristic of some or all of the breeds of sheep, but does not know the characteristics of the classes and grades of wool, to gain a clearer understanding of the latter.

Breed	Class and grade of wool produced
Merino (eastern states)	Delaine, XX, X, or fine unwashed.
Merino (range states)	Fine and fine medium staple or clothing.
Rambouillet	Fine and fine medium staple or clothing and a small amount of half-blood.
Southdown	Half and three-eighths-blood (chiefly three-eighths combing or clothing, chiefly clothing.)
Shropshire	Mainly three-eighths-blood, combing or clothing. Some quarter-blood.
Hampshire	Three-eighths and quarter-blood combing or clothing.
Dorset	Three-eighths and quarter-blood combing or clothing.
Suffolk	Three-eighths-blood combing and clothing.

¹ Compiled from National Wool Warehouse and Storage Company's Bulletin, Dec., 1915.

² U. S. Dept. Agr. Bul. 206, p. 21.

Cheviot	Quarter-blood combing.
Oxford	Quarter and low quarter-blood combing.
Corriedale	Three-eighths-blood combing.
Cotswold	} Low quarter-blood combing or braid.
Lincoln	
Leicester	

Government standards.—In an attempt to secure greater uniformity in the classing and grading of wools, and, if possible, standardize them, the U. S. Bureau of Agricultural Economics in 1920 formulated "Tentative Wool Grades." After these had been tested in actual practice they were declared "Official Standards" by the Secretary of Agriculture, effective July 1, 1923. The classification is very similar to the commercial classification which has been described. It includes the clothing and combing classes, and also an intermediate class known as "French or baby combing." These are shorter wools than strictly combing wools, but may be manufactured into a cheaper class of worsted goods by means of the French combing process. The respective lengths assigned to the three classes are as follows:

Grade	Clothing	French or baby combing	Strictly combing
Fine	Under 1¼ inches	1¼ to 2 inches	Over 2 inches
1-2 Blood	Under 1¼ inches	1¼ to 2¼ inches	Over 2¼ inches
3-8 Blood	Under 1½ inches	1½ to 2½ inches	Over 2½ inches
1-4 Blood	Under 1½ inches	1½ to 2¾ inches	Over 2¾ inches
Low 1-4 Blood	Under 2 inches	2 to 3 inches	Over 3 inches

The complete classification is as follows:

Grade and class	Grade and class
Fine clothing	1-4 blood clothing
Fine French combing	1-4 blood baby combing
Fine strictly combing	1-4 blood strictly combing
1-2 blood clothing	Low 1-4 blood clothing
1-2 blood French combing	Low 1-4 blood baby combing
1-2 blood strictly combing	Low 1-4 blood strictly combing
3-8 blood clothing	Common
3-8 blood baby combing	Braid
3-8 blood strictly combing	

In addition to the foregoing, separate classes are provided for fleeces which contain much foreign material, are off-colored, or otherwise defective. These classes are as follows: Burry, seedy, chaffy, cotted, dead, merrin, damaged, black or colored, pieces, tags, kempy, tied with sisal. Burry, seedy, and chaffy contain foreign material; cotted wools are matted; dead and merrin are from dead sheep or wools which lack spring and life. The other terms are self-explanatory.

In 1926 the Secretary of Agriculture gave notice of the establishment of new official standards of the United States for grades of wool and wool top, these superseding the standards adopted in 1923.

The new standards are based on a numerical or count system similar to that used in the British market.¹ There are twelve grades, and their relation to the grades previously used and still used to a large extent in the American market, is shown in the following tabulation:²

<i>United States official grades</i>	
Old designation	New designation
Fine	$\left\{ \begin{array}{l} 80's \\ 70's \\ 64's \end{array} \right.$
$\frac{1}{2}$ blood	$\left\{ \begin{array}{l} 60's \\ 58's \end{array} \right.$
$\frac{3}{8}$ blood	56's
$\frac{1}{4}$ blood	$\left\{ \begin{array}{l} 50's \\ 48's \end{array} \right.$
Low $\frac{1}{4}$ blood	46's
Common	44's
Braid	$\left\{ \begin{array}{l} 40's \\ 36's \end{array} \right.$

Sorting wool.—The wool manufacturer buys from the wool dealer the grade of wool which he desires and thus secures fleeces which have a certain average degree of fineness. However, each fleece varies more or less in fineness. Wool from the lower thighs, called the "britch," is usually the coarsest part of the fleece. The shoulder wool is best in strength, quality, and length; the sides are next best, and quality decreases passing backward to the britch. Wool from the back is likely to contain hayseed and chaff. The belly wool is finer than any, but is short, frowzy, not so strong, and lacks character. A "frowzy" wool is one that appears lifeless, and is badly mussed, the fibers and locks lying topsy turvy. The wool from the head is short, coarse, and in dark-faced breeds is likely to contain black fibers. A fleece may be three-eighths-blood or half-blood on the shoulder, while the britch would be quarter-blood. For these reasons, the wool manufacturer usually sorts the wool which he buys. Sorting produces "regular sorts" and "off sorts." The former include the regular classes and grades of wool, and the latter include stained and gray, shorts, fribs, clips, etc.

The stained and gray sort is not usually made unless white goods are to be manufactured. Shorts consist of short wool such as

¹ The numbers or counts represent the hanks of worsted yarn per pound of top to which the wool is supposedly capable of being spun, each hank representing 560 yards. Thus, wool of 50's quality should spin 50x560 yards per pound of top, if spun to the limit. Top is a continuous untwisted strand of the longer wool fibers straightened by combing. After drawing and spinning it becomes worsted yarn.—U. S. Dept. Agr. Bul. 206, pp. 20, 32.

² U. S. Dept. Agr., Service and Regulatory Announcement, No. 100, Aug. 3, 1926, p. 11.

grows about the face, or it may be due to double cutting in shearing. Fribs are short, sweaty, and dungy locks. Clips are locks so incrustated with foreign material that they cannot be scoured clean, but must be clipped off. Other off sorts are often made from wools of various sections. Some of these are tags, paint locks, and seedy. Tags are large dung locks which are badly stained and have a very high shrinkage. Paint locks require clipping off the painted ends of the locks. Seedy wool contains weed seeds, soft burs, etc. It must often be carbonized before using, as explained in a later paragraph.

Wool pulling.—Wool pulleries may be divided into two groups—those owned by packers and forming a part of the by-products division of packing plants, and those owned and operated independent



FIG. 118.—Pulling wool from pelts.

of packing establishments. The wool pullery of a packing plant receives pelts daily, direct from the killing floor. They are at once placed in vats of cold water, which takes out all of the animal heat and removes some of the dirt and blood. The soaking continues from 12 to 24 hours. Packing plants not equipped with pulleries salt their pelts, and when a quantity has accumulated send them to a pullery. Salted pelts are soaked 36 hours, as it requires considerable time to dissolve the salt out of the hide. When removed from the vats, the pelts are given mechanical treatment in a scrubbing machine which washes them in a spray of water, completing the removal of dirt, and leaving the fleece in an attractive, white condition. The wet pelts are then put in a centrifugal wringer which throws out the water to such an extent that the fleece is made very

nearly dry. The pelts are next taken to a room where they are spread, fleece downward, upon wire screens and painted on the inner surface with a thick liquid bearing the trade name of "Depilatory," consisting of a mixture of sodium sulphide and slaked lime. Within 2 to 4 hours after this treatment the wool fibers become loosened and easily part from the hide, coming out by the roots when pulled.

Before pulling, however, the pelts are taken to large rooms where they are spread out on the floor, fleece upwards, being grouped or classified according to the nature of the fleece. The pelts are then taken up and the wool pulled by hand. Coincident with the pulling the operator sorts the wool. Furthermore, the pullery keeps each month's product by itself, thus multiplying the assortments by twelve, and resulting finally in over two hundred kinds of pulled wool, each having a distinct trade name.

Wool pulleries report a strong demand from wool manufacturers for black wool which is used to produce various shades of natural gray by mixing it with white wool. Black wool thus sells at a premium, for the supply is small. Pelts that vary in color through various shades of gray and brown are not in the class of black pelts because the varying color makes them an unknown quantity in color mixing where definite results are wanted. Very few black fleeces are uniformly black. They often contain white, gray, and brown fibers mixed with the black. This explains why the so-called black fleece sells at a discount, while the locks of black wool collected by the wool pullery bring a premium.

The growth of wool must be at least three-fourths of an inch before it may be profitably pulled. Some pelts are not pulled, no matter how long the fleece may be, because the wool is not saleable, or not valuable enough to pay for pulling.

Scouring.—Scouring is the first process in wool manufacturing. The purpose of the scouring process is the removal of dirt and grease from the wool. It does not remove paint, burs, seeds, chaff, nor twine. Paint is clipped from the wool before scouring. If the grease wool comes to the scouring plant in bales, it is first put through a shredding machine which loosens it. This machine is equipped with a blower for the removal of dust, and a screen for the removal of heavy dirt. Scouring is accomplished by passing the wool through a series of four bowls or vats, each containing a different liquor. These liquors are composed as follows:

Bowl No. 1—Mild alkaline solution, preferably potassium; temperature 130 degrees Fahrenheit.

Bowl No. 2—Same alkaline solution as first bowl, plus soap; should be a potash soap; temperature 120 degrees.

Bowl No. 3—Soap solution only; temperature 110 degrees.

Bowl No. 4—Luke warm water.

Nearly all the yolk or grease is removed from the wool in the first bowl. This is done by the saponification of the oil, the soap readily dissolving in the warm liquid. The action of the soap in the second and third bowls is to whiten the wool and give it "life" which it loses in bowl No. 1. After rinsing in the fourth bowl, the wool is passed through a dryer.

During treatment in the bowls, automatic rakes keep the wool moving slowly, for if it is moved rapidly through the liquids it forms a ropy mass. The yolk forms an emulsion in the bowls and may be recovered by chemical processes. It is known as "lanolin," and is much used in salves and ointments. Clipped wools shrink as much as 65 per cent or more in scouring, while pulled wools shrink about 30 per cent on the average and often shrink only 10 per cent. The difference is due to the very thorough washing given to pelts before pulling.

Carbonization.—Burs and much other vegetable matter cannot be taken from wool in scouring. In the combing process, by which worsteds are made, this vegetable matter is combed out with the noils (short fibers not suitable for worsted yarn). It can be eliminated from the noils or from clothing wools intended for carding or woollen purposes by carbonization. This consists in immersing the wool in a dilute sulphuric acid or aluminum chloride solution, and then drying it at about 200 degrees F. This chars the burs and vegetable matter which are then removed by crushing and dusting with little or no change in the wool fiber. The process costs from 1½ to 3 cents a pound and results in an average loss of about 10 per cent in weight. Thus we see why the manufacturer and the wool dealer have a right to object to burry wool, and why they offer a much lower price for it than for clean wool.

Wool clip of the world.¹—Australia and New Zealand combined produce about 33 per cent of the world's wool clip, the United States 10 per cent, Argentina 9 per cent, Russian Empire 9 per cent, the Union of South Africa 8 per cent, Uruguay 4 per cent, the United Kingdom 3 per cent, and all other countries 24 per cent.

American wools and wool growing.—American sheep are said to have no superior in constitutional vigor and strength of wool fiber. The average weight of fleece of American sheep has shown much improvement. In 1840 it was only 1.9 pounds; in 1850 it was 2.4 pounds; in 1860 it was 2.7 pounds; in 1870 it was 3.5 pounds; in

¹ U. S. Dept. Agr. Yearbook, 1930, p. 883.

1880 it was 4.4 pounds; in 1890 it was 4.8 pounds; in 1900 it was 6 pounds; in 1910 it was 6.7 pounds; in 1920 it was 7.3 pounds; in 1929 it was 7.6 pounds. The annual wool clip since 1840 is shown by the following figures:

Annual wool clip of the United States

Year	Sheared wool
1840	35,802,114 pounds
1850	52,516,959 pounds
1860	60,264,913 pounds
1870	162,000,000 pounds
1880	232,500,000 pounds
1890	276,000,000 pounds
1900	288,636,621 pounds
1910	336,896,903 pounds
1920	235,005,000 pounds
1929	308,947,000 pounds

According to the estimates of the U. S. Department of Agriculture,¹ the leading states in 1929 in the production of fleece wool, scoured basis, were as follows:

Production of fleece wool in leading states in 1929

State	Average weight per fleece Pounds	Wool product, raw Pounds	Per cent of shrinkage	Scoured wool Pounds
1. Texas	8.5	41,300,000	61	16,107,000
2. Montana	8.6	28,733,000	64	10,344,000
3. California	6.8	25,636,000	62	9,742,000
4. Wyoming	8.3	26,000,000	65	9,100,000
5. Utah	8.1	19,011,000	64	6,844,000
6. Oregon	8.3	18,849,000	65	6,597,000
7. Idaho	8.8	17,829,000	63	6,597,000
8. Ohio	8.1	14,426,000	55	6,492,000
9. New Mexico	6.8	14,600,000	68	4,672,000
10. Michigan	7.8	8,580,000	53	4,033,000
United States	7.6	308,947,000	60	123,127,000
Pulled wool	...	54,500,000	30	38,150,000
Total United States ...	...	363,447,000	..	161,277,000
Total World	...	3,620,638,000 ¹	..	.....

¹ Based on latest available figures compiled by National Association of Wool Manufacturers and published in Annual Wool Review for 1929, p. 208.

This table brings out some important distinctions in wools. The figures for shrink are interesting; the western states exceed the eastern states by 6 to 15 per cent, due mostly to the greater percentage of Merino breeding in range flocks and hence a more greasy wool with a greater shrink. Western wools also contain more sand and dirt. The introduction of mutton sheep into the corn belt has decreased the average weight of fleece, but has improved the shrinkage. The entire clip of the United States in 1929 was estimated to shrink 60 per cent. Wool buyers fix the price on a scoured

¹ National Association of Wool Manufacturers: Annual Wool Review for 1929, p. 125.

basis, this being the fairest method of dealing and also the fairest basis on which to compare production by states. Washington had the highest average weight of fleece, which was 9 pounds, and Florida was lowest with 3 pounds. Virginia, with 38 per cent, had the lowest shrinkage, and New Mexico, with 68 per cent, had the highest shrinkage.

Imports and exports of wool.—During the year 1929 the United States imported 277,204,000 pounds of wool. Of this total, 60 per cent was carpet wool and only 40 per cent was combing and cloth-

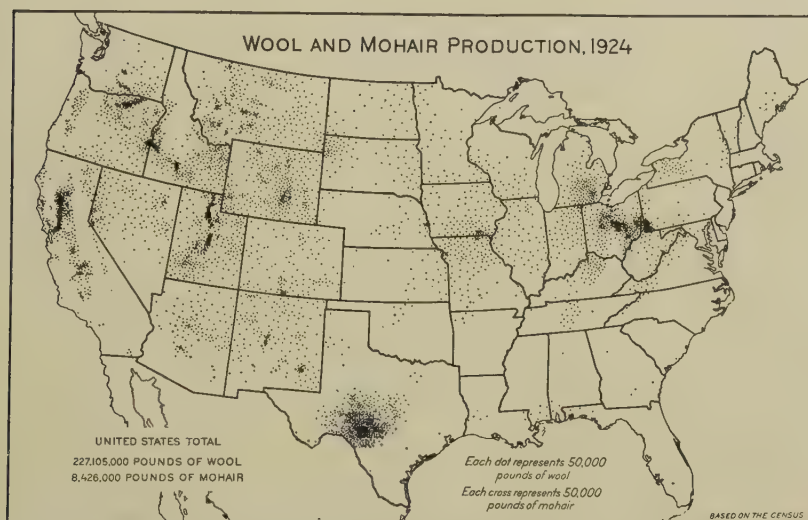


FIG. 119.—Wool production in the United States in 1924. Each dot represents 50,000 pounds of wool.

ing wool. China and Great Britain are the chief sources of our imports of carpet wool. Australia, Argentina, and Uruguay furnish most of our imports of combing and clothing wool. We export less than a million pounds of wool annually. American wool growers produce less than 60 per cent of the wool used by American wool manufacturers. Australia is the largest exporter of wool, the figure for the year 1927 being 763,556,000 pounds; Argentina ranked second with 346,010,000 pounds; South Africa was third with 271,016,000 pounds; New Zealand was fourth with 220,561,000 pounds, and Uruguay was fifth with 151,789,000 pounds. These five countries furnish over 80 per cent of the exports of the world. The principal importing and wool-manufacturing countries are France, Great Britain, United States, Belgium, and Germany.

These five countries annually consume over 80 per cent of the total imports of the world.

Principal American wool markets.—The principal wool markets in the United States are Boston, Chicago, Philadelphia, St. Louis, and New York. During recent years Boston has handled nearly 75 per cent of the total wool crop of this country, and nearly 60 per cent of the foreign wool shipped into this country.

Factors that determine the value of wool.—The value of wool depends upon certain well-established factors, many of which have been indicated and discussed in the foregoing paragraphs on wools and wool manufacture. Following is a list of these factors:¹

1. Shrinkage.—American wools may shrink from 25 to 80 per cent. The loss in scouring is a complete loss to the manufacturer. Grease wools are valued on a scoured basis. Sand, dust, dirt, burs, and seeds lower the yield and affect the value of the clean wool. The following table shows the important part that shrinkage plays in fixing prices. At the top are various prices per pound of clean or scoured wool. In the column to the left are various percentages of shrinkage. By the use of this table we find, for example, that if clean wool is worth \$1.00 per pound and the shrinkage is 65 per cent, the wool is worth 35 cents in the grease, whereas, if the shrinkage is 60 per cent, the grease wool is worth 40 cents.

Relative prices of scoured and raw wool at varying percentages of shrinkage

Shrinkage	Price of clean or scoured wool (cents)												
	30	40	50	60	70	80	90	100	110	120	130	140	150
per cent	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.
25	23	30	38	45	53	60	68	75	83	90	98	105	113
30	21	28	35	42	49	56	63	70	77	84	91	98	105
35	20	26	33	39	46	52	59	65	72	78	85	91	98
40	18	24	30	36	42	48	54	60	66	72	78	84	90
45	17	22	28	33	39	44	50	55	61	66	72	77	83
50	15	20	25	30	35	40	45	50	55	60	65	70	75
55	14	18	23	27	32	36	41	45	50	54	59	63	68
60	12	16	20	24	28	32	36	40	44	48	52	56	60
65	11	14	18	21	25	28	32	35	39	42	46	49	53
70	9	12	15	18	21	24	27	30	33	36	39	42	45
75	8	10	13	15	18	20	23	25	28	30	33	35	38
80	6	8	10	12	14	16	18	20	22	24	26	28	30

2. Class and grade of the wool.—Ordinarily combing wools are worth about 10 per cent more than the short or clothing wools.

¹U. S. Dept. Agr. Bul. 206.

3. Character in wool.—This refers to the color or whiteness of the fiber, the soundness, luster, evenness of distribution of yolk, and the degree of crimp which gives elasticity to the fiber. A fine Merino fiber may be easily stretched by hand 30 per cent beyond its crimped length, and by gradual pressure on a machine fully that much more. A white fiber may be used in the manufacture of white cloth, or may be dyed any desired color. Black, brown, or gray wool can be used only in dark-colored fabrics, and furthermore it is difficult to stain these wools exactly the same shade as white



FIG. 120.—Tender wool showing break.

wool. Kemp, which are hair-like fibers, found mostly on the thighs of coarse-wooled sheep, will absorb little dye, if any at all, and fleeces containing kemp are discriminated against as lacking in character. In kemp the outer scales lie so closely against the body of the fiber that the dye cannot penetrate. The body of the fiber alone absorbs the dye.

4. Strength of fiber.—Tender spots and breaks affect the value of the wool, may change its class or grade, and lessen the strength of the yarn.

5. Use of paint for branding sheep.—This lowers the value of the fleece, necessitates an extra sort at the mill, and requires that the painted ends be clipped off the fibers before scouring.

6. Tags.—These are worth about one-third as much as good

wool. At time of shearing they should be sacked separately. They are objectionable in the fleece because they shrink much more in scouring than the rest of the fleece, and are liable to stain the surrounding wool, especially when wet.

7. **Wet wool.**—In wet wool the fibers may be weakened, and there is danger of spontaneous combustion. It may also cause staining, especially when tags are present.

8. **Burs.**—As has been pointed out, burs cause much trouble and extra expense in manufacture, and hence lower the value of the fleece considerably.

9. **Improper tying.**—The fleece should be tied so that no locks or pieces fall out. These are difficult to sort and buyers object to them when present in large quantities. The use of sisal or binder twine is seriously objected to by dealers and manufacturers because the fibers of the twine shred off and become mixed with the wool and blemish the fabrics made from it. A small, light twine of twisted paper, especially intended for the use of wool growers, is now on the market and should be used exclusively.

10. **Buck fleeces.**—These contain more grease than other fleeces and hence shrink more in scouring. They should be kept separate.

11. **Black wool.**—A black fleece packed with white ones is almost certain to contaminate the latter due to some of the black fibers becoming mixed in the white. Black wool should be packed separately. Black fleeces sell at a discount because they are usually not an even black, but contain white, gray, and brown fibers, often more of these than of black.

12. **Cotted or matted fleeces.**—It is necessary to run these through an opener, which is not done with ordinary wool.

13. **Hand and machine shearing.**—Machine shearing results in a heavier fleece, longer fibers, and freedom from second cuts. Machine shearing may even result in changing the class from clothing to combing.

14. **Packing wool.**—Lamb, ewe, and wether fleeces should be packed in separate bags if possible. Lamb's wool is usually more valuable because of lighter shrinkage. Sewing bags with sisal or other unsuitable twine creates a bad impression. The bag should be sewed securely with a stout, hard-finished twine so as not to burst open.

Wool is purchased from the producer by different methods depending largely upon the size of the clip. Individual producers of territory wool sell their wool by the following methods: (1) direct

sale to central market dealer, (2) by consigning to commission merchant, (3) through local wool pools, (4) through state or regional cooperative wool growers' associations, or (5) direct to manufacturer. Domestic wools are sold (1) to local wool buyers or (2) through local, state, or regional wool pools.

Cooperative marketing and selling.—During the last fifteen years cooperative marketing and selling of wool has come into great favor with many producers in all parts of the United States and Canada. Under this plan the growers of a region pool their wool and sell it collectively to dealers or manufacturers. Prior to selling, the pooled wool may be delivered at a central point, graded, and then offered for sale in uniform lots. Under this plan each grower receives a price in keeping with the actual merit of his product.

Cooperative selling is especially advantageous to producers of small lots of wool of good quality. Formerly, local buyers purchased the clips of farm flocks at about the same price for all fleeces, good, bad, and indifferent, and there was little or no incentive to produce good, clean fleeces, in fact there was, under this plan, something of an incentive to be careless in growing and preparing wool for market. Many growers permitted fleeces to become burry and dirty, and in some instances an excessive amount of heavy twine was used for tying. Under the cooperative plan which includes grading, there is every incentive to grow good fleeces and to market them in clean condition.

State wool pools or pools covering a wide territory are now made regularly by growers in many states. The cooperative plan seems to have first attracted wide attention in the East when Otsego County, New York, pooled 20,000 pounds of wool in 1915 and sold it at an advance of 4½ cents per pound over prices offered by local dealers. In 1928, producer-controlled cooperative associations in the United States marketed approximately 20,000,000 pounds of wool.¹ The greater part of this total was handled by about 15 large-scale organizations. The Pacific Cooperative Wool Producers, Portland, Oregon, received more than three million pounds, and the Ohio Wool Growers' Cooperative Association, Columbus, Ohio, handled almost three million pounds grown in Ohio, Indiana, and Michigan. Other large cooperative wool marketing agencies are the Montana Wool Cooperative Marketing Association, Helena, Montana, the Jericho Pool, Fountain Green, Utah, and the Manti Wool Pool, Manti, Utah. In 1929 there were about 100 active

¹ U. S. Bur. Agr. Econs., Agricultural Cooperation, June 15, 1929.

cooperative wool marketing associations in the United States which served approximately 25,000 wool producers. In Canada in 1928, the Canadian Cooperative Wool Growers, Ltd., Toronto, Ontario, received 3,413,000 pounds of wool at four branch offices and from 13 local associations in eight provinces.

The new national wool pool.—The National Wool Marketing Corporation with an authorized capital of \$1,000,000 was organized at a meeting of wool and mohair growers at San Angelo, Texas, on November 19, 1929. Shareholders in this new organization are regional, state, or local associations of wool growers, these associations subscribing for one share of stock (par value \$100) for each 100,000 pounds of wool handled. The individual producer may contract his wool for delivery to his regional association. Regional associations may in turn contract the regional pool for delivery to the National Wool Marketing Corporation. Thus, the new national organization may be termed a "pool of pools." The corporation and its member associations will be financed by a selling charge on wool handled. The aim and purpose of the new national organization is to increase the bargaining power of growers by collecting as much wool as possible into one large pool, and to bring about a more orderly marketing of wool in this country than has prevailed in the past. The Corporation is cooperating with the Federal Farm Board in providing preshearing advances or loans to growers, and other advances are made to growers at the time the wool is shipped. The new national organization is receiving strong support from state and regional associations. Leading wool growers have long favored such a plan.

Mohair—Characteristics and Production

Mohair is the product of the Angora goat. The fiber is coarse, very long, exceedingly lustrous, and has very little crimp. It is more closely allied to wool than to hair. Its strength and elasticity compare favorably with wool. The fiber has about the same diameter as the wool fiber of long-wool sheep. The scales on the surface of the fiber are thinner and the surface of the mohair fiber is smoother than wool. Mohair is practically free from felting properties. It takes a fast, brilliant dye.¹

Mohair is used in the manufacture of upholstery materials such as plushes and braids, and of men's summer suits, lining materials, draperies, laces, hats, rugs, piled fabrics for coats, and for

¹ U. S. Dept. Agr. and Dept. Comm., Misc. Circ. 50, The Angora Goat and Mohair Industry, March, 1929, pp. 5-8.

decorative trimmings. Mohair plush is a material of exceptional durability much used for automobile upholstery and for railroad car seats. As a rule these fabrics have a cotton base. The long silky mohair pile is bound into the cotton base. Long-fibered mohair is used as a substitute for human hair in the manufacture of wigs and switches which are used extensively for theatrical purposes. Mohair suitable for this purpose brings the highest price.

Mature Angora bucks of good type weigh from 125 to 175 pounds and the does weigh 80 to 125 pounds. The annual production of unscoured mohair per goat is about $3\frac{1}{2}$ to $4\frac{1}{2}$ pounds for the doe and kid band under range conditions and for wethers about 4 to 5 pounds. Much of the mohair is clipped twice a year. Pure-breds often clip double the weights mentioned.¹

Turkey, the Union of South Africa, and the United States are the leading mohair-producing countries. In 1927, Turkey had 3,162,000 Angora goats, the United States 3,159,000, and the Union of South Africa 1,499,000. Texas, Arizona, Oregon, New Mexico, California, and Missouri are the principal producers of mohair in the United States. In 1928, 3,391,000 goats were clipped in these six states, producing 14,522,000 pounds of mohair, or an average of 4.3 pounds per goat.² In 1920, all of the 48 states reported fleece-bearing goats, but approximately 90 per cent of them were in the Southwest and Pacific coast region. Texas had 70 per cent. In 1929, the United States imported 3,134,000 pounds of mohair, practically all from Turkey and the Union of South Africa.

¹ U. S. Dept. Agr. and Dept. Comm., Misc. Circ. 50, p. 21.

² U. S. Dept. Agr. Yearbook, 1930, p. 886.

PART III---SWINE

INTRODUCTION

The hog is universally known as the "mortgage lifter." No other animal has contributed more toward the success of farming in the United States. This country leads the world in hog breeding and pork production. The money-making ability of the hog is based on the following advantages of the hog and of hog raising:

1. Hogs are the most efficient converters of grain and certain other feeds into meat. They make larger gains in weight in proportion to feed consumed than other farm animals.

2. They are most prolific, commonly farrowing from 6 to 10 pigs, and will raise two litters per year.

3. Returns come quickly. The pigs may be marketed within ten months after the sows are bred. The sow may be bred when eight months old, farrowing her first litter at twelve months of age.

4. Of all meat-producing farm animals, the pig is best adapted to diversified and intensified farming where a large income is desired from a small acreage.

5. The hog has a higher dressing percentage than any other animal, and a larger proportion of the live weight is edible than of any other animal.

6. Pork is the most nutritious meat and has better curing and keeping qualities than any other meat.

7. No other animal equals the hog in its fat-storing ability, and hog fat is the most valuable fat produced by domestic animals.

8. Hogs are the most efficient farm animals in converting certain wastes and by-products into profits. This statement applies to grain wasted by fattening cattle,¹ utilization of garbage, and utilization of dairy by-products such as skim milk. In some wooded sections of the country, pigs convert acorns, other mast, and roots into saleable form.

9. Hog raising requires a smaller investment in animals and

¹W. W. Smith of Purdue University states that for every bushel of ear or shelled corn fed to steers, the hogs following the cattle produce an average of from one to two pounds of pork; and that when the grain is crushed or ground before feeding to cattle, from a quarter to a half pound of pork is produced. With hogs selling at 10 cents per pound, a saving of 2½ to 20 cents per bushel of corn fed to the cattle is effected by the hogs.—Pork Production, p. 4.

equipment and yields quicker and relatively larger results than any other branch of animal husbandry.

Economy of the pig as a meat producer.—W. W. Smith of Purdue University states¹ that the cost of the pig at birth is much less than that of the calf or lamb, and that the cost of subsequent gains is lower. He states that to produce 100 pounds of gain during the market-finishing period, 1,000-pound steers require an average of 800 pounds of grain and 475 pounds of legume hay; 65-pound lambs require 400 pounds of grain and 500 pounds of legume hay; and 200-pound pigs require 450 pounds of grain and no hay. He mentions also that the brood sow brings a relatively better price when sent to market after her days of usefulness in the herd are over than does the cow or the ewe.

When to the above facts it is added that during ten years at the Chicago market² all hogs marketed there brought an average price of \$9.65 per cwt., all beef steers \$8.85, all butcher cows and heifers \$6.35, all fat lambs \$9.60, all yearling wethers \$7.90, and all older sheep \$6.70, it might be assumed that hogs are easily the most profitable of all meat-producing animals. This may be true. But the above figures do not include heavy losses of pigs which occur annually, especially between farrowing time and weaning time. A much larger percentage of the pigs born annually fail to reach the market than is true of calves or lambs. The initial (birth) cost of every dead pig must be added to the initial cost of his surviving litter mates, and the feed he consumed and the labor he required must be added to the cost of feeding them in order to determine the cost of producing pork. Furthermore, the ability of steers and lambs to produce fairly good carcasses on grass and roughage alone, and the absolute failure of the pig under the same conditions should be kept in mind.

Economy of the pig as a producer of human food.—The pig ranks very high among all farm animals in ability to manufacture a large amount of human food from a given quantity of feed. Dr. W. H. Jordan of the New York (Geneva) Experiment Station has compiled the following table³ showing how the farm animals compare in the economy with which they convert their feed into edible solids. "Edible solids" means marketable product minus all water, bone, and gristle. Note the high rank of the pig:

¹ Pork Production, p. 7.

² Compiled from the Drovers Journal Year Books of Figures covering the years 1909 to 1918 inclusive.

³ The Feeding of Animals, p. 423.

Human food produced by farm animals from 100 pounds of digestible matter consumed

Animal	Marketable product Pounds	Edible solids Pounds
Cow (milk)	139.0	18.0
Pig (dressed)	25.0	15.6
Cow (cheese)	14.8	9.4
Calf (dressed)	36.5	8.1
Cow (butter)	6.4	5.4
Poultry (eggs)	19.6	5.1
Poultry (dressed)	15.6	4.2
Lamb (dressed)	9.6	3.2
Steer (dressed)	8.3	2.8
Sheep (dressed)	7.0	2.6

It should be noted, however, that the table does not take into consideration the relative cost or value of the feedstuffs consumed by the different animals. Failure to do so is especially detrimental to the sheep, steer, and lamb. Nor does the table include the labor cost of producing the various products. Neither does it include in the case of the dairy cow the feed and labor required to grow the cow or heifer to milking age. Nor does it consider the relative food values of the edible solids produced by the various animals. If these factors were included, the pig would certainly approach the milk cow even more closely in economy of production, and might equal or surpass her. We should remember that any fair comparison must include all costs and all factors in any way concerned in economy of production. Unfortunately for the pig this would include the losses caused by disease, exposure, injuries, and other causes.

The writer desires to emphasize the fact that too much importance should not be attached to comparisons similar to the one made in the above table. Such comparisons are valuable only in that they make us think and impress us with the special attributes of different animals. Each kind of live stock has its proper place and each is most economical and profitable under the right set of conditions. For most economical utilization and conversion of pastures and farm crops, all kinds of farm animals are essential. And as one man remarked, "We cannot live by milk, or pork, or eggs, or beef alone; and the cow doesn't lay eggs, and the steer doesn't give milk, and the lamb can't grow pork, and the chicken is no good for beef; so why argue about it?" To which his friend replied that he "guessed that was so." Writers on live-stock subjects often make comparisons to emphasize particular points. Readers sometimes make the mistake of attaching an importance to such comparisons, or of drawing a conclusion from them, that is not justified or was not intended by the writers.

Types of hogs.—Swine are useful as a source of meat and lard. Some swine produce meat only, and some produce lard as well as meat. Differences in the demands of consumers of pork, together with differences in the kinds of feed available for pork production, have resulted in the establishment of two distinct types of swine, lard type and bacon type.

The lard hog is an American production found chiefly in the corn-belt states where corn is the principal feed for all farm animals. Corn is a great fattening feed, and when fed to hogs it is converted into fat from which lard is made. Breeders have therefore developed a type of hog specially adapted to converting feed, principally corn, into fat, and at the same time growing a carcass highly valued for the various cuts of meat which it yields.

The bacon hog is also found in America, principally in Canada, however, which is outside the corn belt. In Canada the feeds available for pork production are peas, barley, wheat, oats, rye, skim milk, and roots. As compared with corn, these feeds are not so fattening; they are muscle builders, and hogs produced with such feeds take on relatively little fat and are not useful as a source of lard. Canadians have made no effort to compete with the hogs of the corn belt; instead they produce a hog suitable for the English and Canadian trade—a hog whose carcass yields the largest proportion of high-grade bacon.

From what has been said it may appear that there is no real hereditary difference in the form, structure, and ability of the two types of hogs, but that the differences between them are solely the result of differences in the feeds upon which they are produced. This is largely true, yet it is a fact that when pigs of the bacon type are brought into the corn belt and fed on fat-producing feeds, they never entirely lose the bacon type; and when the lard hog is taken into a bacon-producing section and fed on muscle-building feeds, there is the same degree of change, but the lard hog does not lose his identity under such a system of feeding. Therefore we must conclude that there is something besides the difference in the feeds which accounts for the two distinct types; in other words, there is an hereditary difference between the two kinds of swine.

Careful selection and breeding and the establishment of definite types of animals suitable to special purposes cannot accomplish the desired ends unaided. The feeding and care must receive as much attention as the breeding. No matter how well bred an animal may be, and no matter how great may be its tendency to conform to a

given type, it must enjoy a favorable environment before its inherited good qualities can fully assert themselves and thereby enable the animal to fulfill its mission.

The breeds of hogs, their classification according to type, and the number of registered purebreds of each breed in the United States as shown by the 1920 census, are as follows:

Type	Breed	Number
LARD TYPE.....	Duroc-Jersey	819,117
	Poland-China	726,504
	Chester White	191,207
	Hampshire	106,978
	Berkshire	86,676
	Spotted Poland-China	47,703
BACON TYPE....	Yorkshire	6,353
	Tamworth	5,639
	All other	59,723 ¹
Total.....		2,049,900

¹ Includes Mule-Foot, Cheshire, Essex, Victoria, Small Yorkshire, Large Black, Red Berkshire, and other minor breeds.

The Berkshire and Hampshire do not possess true fat or lard type, but have something of a bacon tendency. This is especially true of the Berkshire as bred in Canada.

Definitions of Hog Terms

Boar.—Breeding male, any age.

Sow.—The female, any age.

Gilt.—A young sow, usually under twelve months and before she has farrowed a litter.

Barrow.—Unsexed male, castrated when a young pig. The best age to castrate pigs is from 6 to 8 weeks old, before weaning.

Stag.—Unsexed male, castrated when mature or so far advanced toward maturity that masculinity is plainly evident in head, neck, and forequarters. This constitutes coarseness in a market animal.

Shote.—A young hog weighing from 100 to 150 pounds.

Show Yard Classification by Ages

The base dates for classifying hogs by ages are March 1 and September 1, and the classes by ages are as follows:

Junior pig class.—Animals are eligible to this class that were farrowed on or after March 1 of the year shown.

Senior pig class.—Farrowed on or after September 1 of the preceding year and before March 1 of the year shown.

Junior yearling class.—Farrowed on or after March 1 and before September 1 of the preceding year.

Senior yearling class.—Farrowed on or after September 1 of the second preceding year and before March 1 of the preceding year.

Two years old and over (aged) class.—Farrowed before September 1 of the second preceding year.

For example, during the summer, fall, and winter show season of 1930, junior pigs are those farrowed on or after March 1, 1930; senior pigs, September 1, 1929-February 28, 1930; junior yearlings, March 1-August 31, 1929; senior yearlings, September 1, 1928-February 28, 1929; aged animals, before September 1, 1928.

Junior champion.—Best animal under one year.

Senior champion.—Best animal one year old or over.

Champion.—Best animal any age.

Grand champion.—Best animal any age or breed. The term "grand champion" is also frequently applied to champions.

CHAPTER XXII

THE AMERICAN OR LARD TYPE HOG

The United States has created comparatively few of the breeds now found within her borders. By the time this country reached that stage in her live-stock development when improvement in domestic animals became imperative, European nations had met and solved a similar problem by the creation of numerous useful breeds. It was but natural, therefore, that many of these foreign breeds were imported to this country, and it was fortunate indeed that most of them proved fully capable of fulfilling the requirements of our stock growers. We were thus afforded an easy short cut across what would have been a long, laborious period in the development of our live-stock industry. We borrowed whenever such procedure was practicable, and the fact that we have never found it really necessary to create a breed of draft or carriage horses, beef, dairy, or dual-purpose cattle, mutton sheep, or bacon hogs shows how great is our indebtedness to the breeders of Europe.

Our needs were not entirely met, however, for we have created a breed of trotting horses, a breed of saddle horses, a breed of jacks, a breed of fine-wool sheep, and a number of breeds of lard-type swine. We have also found it necessary to modify slightly some of the breeds we have adopted, and to our credit it may be said that we have made certain changes in some of these adopted breeds which, as viewed from the standpoint of American conditions and requirements, represent decided improvements. The Polled Shorthorn, the Polled Hereford, the "American type" Hereford, and the "American type" Berkshire are examples of such modifications.

The extended patronage which we have given to foreign stock and the lack of necessity for developing breeds of our own, while highly advantageous, has tended to dim our own glory as a live-stock breeding nation. If, because of this fact, our live-stock industry needs a redeeming feature, it is furnished by the creation of a distinctly American type of hog, which includes several breeds. European breeds of swine proved so fully incompetent to make pork under American conditions that our breeders found it necessary to create distinctly new breeds of a new type, and this work has been so well done as to give us a clear title to the distinction of leading the world in swine breeding and in pork production.

Our conditions demand a type of swine which can consume a ration composed largely of corn and utilize it to advantage in the production of meat and lard. This type of hog is known as the American or lard-type hog, and it has played no small part in the rapid development of American agriculture and in the prosperity of our farmers. "King Corn and the American Hog" have constituted an invincible combination, creating a channel of disposal or market for corn, and supplying the people of this and other countries with highly palatable and nutritious meat at a moderate price.

Present-day swine breeders and pork producers are not unanimous in their opinions concerning what is the most profitable type of lard hog to produce for the market. The writer has interviewed a large number of pork producers, breeders of purebred hogs, and college and experiment station workers relative to this matter, and the consensus of opinion seems to be as follows:

1. A very compact, wide, low-set pig matures earliest and fattens most easily, but does not make the most rapid or economical gains and cannot be profitably carried beyond a certain rather low limit of weight. Sows of this type are not prolific.

2. An extremely long, narrow, and leggy pig grows rapidly and attains large size, but is likely to be lacking in capacity of middle and feeding qualities and is often difficult to fatten at market weights (200 to 250 pounds). Sows of this type are prolific.

3. The most profitable market pig is intermediate in type between the two types mentioned above.

4. The most profitable market pig is the product of a large sire and dam and has inherited the ability to grow rapidly and to make large daily gains on feed.

5. He must have considerable length of body.

6. He must have at least medium length of leg.

7. He must have at least medium size of bone.

8. He must have a good constitution and good feeding qualities as shown by depth and fullness of chest and middle.

9. He must be smooth, and free from coarseness in head and bone.

10. He must be active, and strong in feet, pasterns, and legs.

11. He must be strong in back and loin, showing a nicely arched top line.

12. He must be neat in jowl, firm in fleshing, and free from flabbiness along the belly and in the lower part of the ham.

13. When fattened for the market he should be fairly wide throughout, indicating a good finish, but a very wide type is not

desirable for two reasons: (a) Too frequently it is associated with a short, low-set, chunky, slow-growing type. (b) It indicates an excessively fat condition not favored by the packer, and final gains that are not ordinarily economical or profitable to the producer.

The following description applies particularly to the fat barrow raised and fattened for the market. The type desired in lard hogs for breeding purposes is described in Chapter XXVII.

The **general appearance** of the lard-type hog fattened for the market embodies a long, deep, and reasonably wide conformation, together with great smoothness. The legs should be of medium length, so as to give a rather upstanding, but not leggy, appearance.

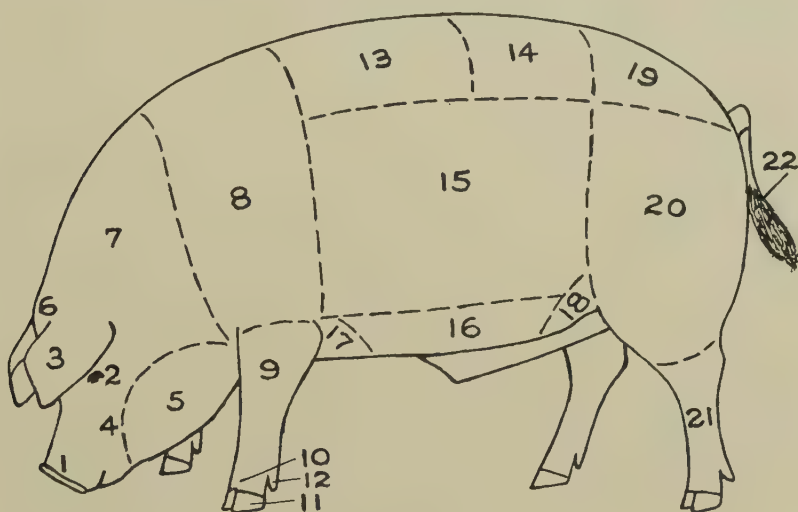


FIG. 121.—Points of the hog.

- | | | | |
|----------|--------------|----------------|----------------|
| 1. Snout | 7. Neck | 13. Back | 18. Hind flank |
| 2. Eye | 8. Shoulder | 14. Loin | 19. Rump |
| 3. Ear | 9. Fore leg | 15. Side | 20. Ham |
| 4. Cheek | 10. Pastern | 16. Belly | 21. Hind leg |
| 5. Jowl | 11. Toes | 17. Fore flank | 22. Tail |
| 6. Poll | 12. Dew claw | | |

He should be tall as measured from his back to the ground, rather upstanding as measured from his belly to the ground, yet deep from back to underline. The top line should be arched, showing an even curvature from shoulders to tail, insuring against weakness of back and loin. The highest point in the top line should be midway between shoulders and hips, whereas frequently the highest point is over the hips. In the latter case the rump is usually steep and drooping and the hind legs do not come down straight but are placed too far under the body. The hips should have about the same height

as the tops of the shoulders, and the rump should round off rather gradually. The underline should be straight, trim, and level, insuring against paunchiness and against flabbiness in fleshing along the belly. The flanks should be well let down. The hog should be uniform in his width and uniform in his depth, showing no tendency to taper in width and to be heavy in shoulders and light in hams.

When a view is taken directly down upon the top of the hog he should show good width and marked uniformity of width throughout. His top from shoulders to tail should be nicely rounded over



FIG. 122.—Excellent type in the fat barrow. Champion Poland-China barrow and reserve grand champion at the 1922 International. Bred, fed, and exhibited by Iowa State College. Lamé at time photograph was taken, but he shows excellent form, condition, and smoothness, good quality, and exceptionally good top line, side, ham, and pasterns. He stands at the right end of the line in Fig. 126.

from side to side without any tendency to be ridgy or peaked. His sides should be well filled out so that they are even with the shoulders and hams, indicating good condition and insuring smoothness and evenness in form. He should be very smooth in both form and fleshing, and should show refinement of head, ear, coat, and skin. He should have bone of medium size, free from any roughness and coarseness and also free from over-refinement and weakness. His legs should be straight and he should be active and should show good style. The lard hog is milder and more quiet in disposition

than the bacon hog, but a sluggish, inactive hog is objectionable. Lard hogs should be fairly active. This makes them better grazers, insures exercise, and helps to develop heart and lung capacity and strength of feet and legs. Too frequently the fat, finished pig is short winded and is weak in underpinning, so that it becomes a difficult matter and perhaps impossible to get him safely to market.

The **head** is of medium size, medium length, broad between the eyes, and short of snout. A narrow head and finely pointed snout are indications of a poor feeder. The shape and length of head vary according to the breed, but in none of the lard breeds is much length



FIG. 123.—Berkshire barrow, grand champion at the 1921 International. Fitted and shown by the University of Minnesota. Especially good in depth of body, finish, smoothness, and quality.

or narrowness desirable. The eyes should be large, prominent, and clear as possible, a small, sunken eye obscured by rolls of fat around the socket being objectionable. The carriage of the ear varies according to the breed, being erect in some and drooping or broken in others. In all the breeds, however, a fine and medium-sized ear, neatly attached to the head, is desired. The jowl should be neat and trim. It should not be loose and flabby, because this indicates an excessively fat condition, lack of firmness in covering, and lack of intermixture of fat and lean in the carcass. Trim, firm jowls from light-weight hogs may be made into bacon squares. The cheeks and jowls should be free from wrinkles or seams. The poll of the head should be broad and carry forward prominently.

The **neck** should be of medium length, slightly arched, and medium broad on top. A neck that is narrow or peaked on top is not often associated with a body of the desired conformation, and it also denotes lack of condition.

The **shoulders** are very frequently too open and prominent, so that as one looks down at the top of the hog the shoulders are found to be much the widest part of the animal. They should be well laid in, very smooth, and have no greater width than the rest of the body, such a hog being much more desirable from a market and carcass point of view. The tops of the shoulders should not stand open and apart, but should be laid together and thickly fleshed so as to present a fairly wide and very smooth surface in harmony with the rest of the top.

The **front legs** should be of medium length, this being a somewhat variable feature depending on the breed, and they should also be straight. It is especially important that the pasterns shall be short, upright, and very strong, and that the feet shall be strong also. These points should be particularly emphasized, for it is a fact that weak, broken-down pasterns and weak, spreading toes are among the most common and most serious faults to be found in swine of the lard type. Weak legs may be due to a natural or inherited weakness, or to improper feeding during the growing period. If growing pigs are fed on corn exclusively, they are liable to develop weakness of the legs, because corn does not carry sufficient bone- and muscle-building constituents to satisfy the demands of the animal during the growing period. The bone of the market hog should be medium in size, free from coarseness, and amply sufficient to carry the weight of the hog and to provide strength of feet, pasterns, and legs.

The **chest** is an evidence of the constitutional vigor possessed by the animal. It should be deep and wide, and should be well filled out behind the shoulders and elbows, affording a large heart-girth. The underline should not cut up between the fore legs, but carry straight forward so as to give as much depth through the chest as through the middle of the body.

The **back and loin** of the lard hog are very important parts. They should be rather long and of good but not excessive width, and, as the animal is viewed from the side, they should be arched. The top of the hog should be thickly fleshed and smooth. There should be no marked rounding off from the middle line, but instead a slight arch over the top from side to side and good width of top due to well-

sprung ribs and thick but not excessive fleshing. A "ridgy" back is an evidence of lack of fleshing, and a narrow, "sunfish" conformation is very faulty for the same reason and also because such animals are often deficient in constitution and feeding qualities. A dip in the back, or sway-back conformation, greatly detracts from the appearance of the animal and may indicate weakness of muscling; hence the cuts from the back and loin may be lacking in lean meat.



FIG. 124.—Duroc-Jersey barrow, grand champion at the 1928 International. Fitted and shown by Iowa State College. His finish, smoothness, trimness, balance, and heavy hams were strong points. He was especially free from excess fat and flabbiness at the jowl, along the belly, and in lower part of hams.

The **sides** of the hog should be long from shoulder to ham and should carry down straight and deep from back and loin to belly and flanks. Very short hogs raised and fed for market are open to objection because such a type does not grow rapidly. On the other hand, extreme length is often secured at the expense of constitution and feeding qualities. Extremes are to be avoided. When fattened for the market, the sides should be thickly and smoothly fleshed so that every point along the side fills out to meet the same straight line from shoulder to ham. Wrinkles in the skin along the side are objectionable because they injure the smoothness of appearance which is so desirable, and if the wrinkles are very deep and are permanent, that is, do not disappear when the hog changes

position, they are called "creases" or "seams" and are highly undesirable. Creases most often occur just behind the shoulder, but they may occur all along the side. They involve not only the skin but also the flesh underlying the skin, so that when the fingers are inserted into them they are found to be deep and pronounced. They indicate lack of quality and lack of evenness in fleshing, and are especially objectionable because they remain in the side meat after it has been pressed and cured by the packer, thereby injuring the appearance of such cuts and affecting their selling price.

The **belly** should be straight, not paunchy, insuring a good dressing percentage when the hog is killed. The belly should be trim, not flabby, and should be wide rather than narrow or V-shaped.

The **rump** should be long and as wide as the rest of the top, and it should carry out from hips to end of body with a slight curve downward to coincide with the arch of the entire top from head to tail. Very often the rump will be found very steep or drooping, the hips being carried too high and the tail set very low. Accompanying this kind of a rump, and to a certain extent causing it, is a faulty position of the hind legs, the feet being set too far under the body. This constitutes a weak conformation of the hindquarter, and gives the animal an ungainly appearance. The rump should not taper in width from hips to end of body, but be uniform in width throughout.

The **hams** really include the rump as well as the thighs and twist. They should be large and well developed, being deep and of good width, with the thickness and fullness carried well down toward the hocks. They should be reasonably firm in flesh and should be neat in form. Flabby and baggy hams are undesirable because they carry too much outside fat and require too much trimming off before they can be sold. Some hams lose 15 per cent in trimming at the packing house.

The **hind legs** should be of medium length and should carry down straight and vertical from the hocks to the ground. The pasterns should be short, upright, and very strong, the feet well formed, and the toes strong. The bone of the market hog should be of medium size and free from coarseness.

The **hair** should be straight rather than curly, and should be fine. A harsh, bristly coat is an evidence of coarseness. A curly coat is objectionable because curly hair is usually coarser than straight hair, and curly-coated hogs do not shed their coats properly, which injures the appearance. A swirl or rose in the hair on the back or rump detracts from the appearance, and is objectionable

for that reason. The hair should be abundant, straight, and fine, and should lie close to the skin. Such a coat affords the most protection and adds to the attractiveness of appearance.

The **quality** of the lard-type hog is determined by the refinement of the head, hair, and bone, smoothness of finish, and freedom from wrinkles and creases. The hog with quality has a clean-cut, well-bred appearance that pleases not only the producer and hog fancier, but also the butcher, because such a hog yields a neat, tidy carcass that attracts buyers, and the cuts of meat show a refined texture that is not to be found in the cuts from a coarse, rough hog.



FIG. 125.—Some essentials in type well illustrated. Duroc-Jersey barrow shown by the University of Minnesota, second in class to the grand champion at the 1922 International. Remarkably good in top line, bone, pasterns, feet, head, neck, shoulders, and smoothness. Lacking somewhat in depth of body and condition because he could not be given a full feed without making him too heavy for showing under the 1922 International classification.

The proper **finish** of a lard-type hog is secured by a fairly high degree of fattening. When handled along the top, below the shoulders, and at the lower border of the hams, the fleshing should be firm instead of soft as is often the case, especially in some breeds. Some hogs become lumpy in their covering of fat, which is objectionable. When the fattening has proceeded far enough to round out the lines of the animal and give him a smooth, springy, mellow

covering of flesh, he is in the right condition to meet with most favor from the butcher, and, as a rule, this degree of finish is most profitable to the producer.

The **temperament** of the lard-type hog is quite different from that of the bacon hog, being less active and more inclined to quietness, lying down, and the taking on of fat. Ideas as to what is most desirable in the temperament of this type of swine are tending somewhat away from the one formerly in favor, namely, that a hog should eat and lie down, and that a minimum of exercise is conducive to greatest economy in pork production. Most producers believe that better results are secured if the hog is disposed by temperament to take considerable exercise, especially during the growing period; they are selecting more active hogs for breeding, and are managing their young stock in such a way as to induce them to take a large amount of exercise. This results in growthy pigs of



FIG. 126.—Five Poland-China barrows, first in get-of-sire class and including the grand champion pen of three barrows at the 1922 International. Bred, fed, and exhibited by Iowa State College.

robust constitution and lessens the danger of disease. Exercise also develops the muscles and strengthens the pasterns and legs. Notwithstanding this present-day tendency to select a more active hog than in the past, there must always be considerable difference between the lard type and bacon type in this respect, the former being more quiet, slower in movements, and having greater natural aptitude to fatten.

The **weight for age** is an important consideration because it is a measure of the profit-making ability of the hog. Pigs weighing

over 150 pounds, fattened for the market, should have at least one pound of weight for every day of their age. On this basis, a pig six months old should weigh not less than 180 pounds. It is not unreasonable to fix the standard of weight for lard hogs six months old at 200 pounds; nine months, 300 pounds; twelve months, 400 pounds. Hogs are matured at about thirty months of age. Mature boars in good condition should weigh 800 pounds or over; sows, 600 pounds or over. The average weight of hogs received at the large markets at the present time is about 225 pounds. Hog growers are agreed that weights from 200 to 250 pounds for market hogs are usually most profitable.

CHAPTER XXIII

THE BACON-TYPE HOG

The bacon hog presents some very marked differences when compared with the lard hog in form, fleshing, and temperament. These differences are very necessary because the bacon hog yields a product that is quite different from that of the fat or lard hog. The foremost countries in bacon production are England, Denmark, and Canada, the first mentioned consuming the surplus production of the other two. It is a superior product to that with which the American public is supplied, being the finest that is produced. American bacon is the belly meat of the lighter and thinner hogs of the lard type, but English bacon is supplied by a hog the entire side of which is suitable for bacon. Denmark and Canada ship bacon to England in the form of what is called the "Wiltshire side." A Wiltshire side represents half the carcass of the hog minus the head and legs. The neck, shoulder, back, loin, side, belly, and ham are included, and all of these parts are retailed as bacon except the ham and shoulder.

The best bacon contains a relatively large amount of lean meat and small amount of fat. The price charged for bacon at wholesale or retail is very largely regulated by these features, a cheap slab of bacon always being characterized by greater thickness, little lean, and much fat. The production of high-quality bacon therefore necessitates a different kind of hog than the lard hog, a hog disposed to be muscular and active, but not a hog that fattens readily. The production of the best bacon also necessitates feeding this hog on such feeds as will furnish nitrogenous or muscle-building materials in abundance, the carbonaceous or fat-forming elements of the ration being supplied in much less amount than would be advisable if lard hogs were being fed. This fact explains why but few bacon hogs are found in the corn belt, and also why the United States is able to produce the lard hog at lower cost than he can be produced elsewhere. Whereas corn plays a large part in the production of lard-type swine for the market, the bacon hog is fed on such feeds as peas, barley, oats, and skim milk or buttermilk, which are much better suited to bacon production than is corn, because they contain a larger percentage of protein.

Weights desired in bacon hogs.—It is important that the pro-

ducer of bacon hogs turn them off to market at that period in their development when the character of the flesh will be nearest the bacon ideal. To be more explicit, if the hog is marketed too young its flesh will be watery and flabby, whereas further feeding and more age result in a more desirable carcass. Young pigs have a very strong tendency to utilize their feed for growth and as they become older and are more matured they fatten much more readily. It is for this reason that the best bacon comes from hogs within certain limits of weight. Bacon pigs vary in the weight at which they acquire the proper degree of finish depending upon how they are



FIG. 127.—Fancy market bacon pig.

fed and also upon the breed and the individual. When various breeds are fed alike, or individuals of the same breed are fed alike, some reach the proper finish earlier than others. George B. Rothwell states¹ that some strains of Berkshires are finished at 170 pounds, others at 200; and that some Yorkshires finish best at 210 to 220 pounds and over. Experience has shown that a weight of 160 pounds is the minimum weight at which to market a bacon hog and that the upper limit is 220 pounds. These figures represent the extremes; the best bacon carcasses are from hogs that weighed 185 to 200 pounds. This does not mean that the bacon hog reaches maturity at a weight of 200 or 220 pounds, or

¹ Dominion Experimental Farms, Seasonable Hints, No. 24, Nov., 1922, p. 34.

that it is desirable that he should do so. The matured weight for boars in good flesh should not be less than 700 pounds, and for sows not less than 500 pounds.

When the carcass of a bacon hog is split down the back, the layer of fat along the spine and back should not be less than 1 inch or more than $1\frac{1}{2}$ inches in thickness, and it should be as uniform in thickness as possible from one end to the other. The production of the best Wiltshire sides is possible only from hogs that are long from shoulder to ham, light and smooth in the shoulder, neck, and jowl, and very straight and trim along the belly.

When thinking of a bacon hog we usually have in mind such a hog as the market wants, in other words, a hog suitable for slaugh-



FIG. 128.—Correct bacon type.

tering and cutting up into Wiltshire sides. Also, from what has been said of the importance of certain weight requirements, it is at once apparent that boars and breeding sows are not desired by the packer. If, however, their form, quality, and temperament are such as will cause them to transmit to their pigs the characteristics which are necessary in order that these pigs may be fed out successfully for the bacon market, then the boar and sow are said to possess bacon type. In judging breeding stock, certain allowances must therefore be made and certain points must be emphasized which do not concern us in judging bacon hogs for slaughter. The same general principles and the same general type apply in both cases, but the judge must emphasize certain points that are peculiar and essential in each.

The **form** of the bacon hog is quite different from that of the lard hog. There is much less thickness and depth of body, greater length of leg, a lighter shoulder, neck, and jowl, and greater length from snout to tail, especially from shoulder to ham. From the snout to the rear border of the shoulder the hog should be comparatively short, this being the low-priced end of the carcass. There is considerable difference between the retail prices received for the front and hind ends of the Wiltshire side. Length of side from shoulder to ham and length of ham from front to rear are of very great importance, but it is a mistake to make everything else secondary in importance to length; length should not be carried to the greatest possible extreme. The hog should have enough depth and width of body to give him a strong constitution in a well-developed chest and middle. This applies both to the market hog and the breeding animal. There should be as much depth of body in front as behind, and as much width at one point as another—in other words, the hog should be symmetrical or balanced in his conformation. Great smoothness from one end to the other is a prime essential, and smoothness must be secured without the assistance of much fat, such as greatly assists in giving smoothness to the lard hog.

Proper **quality** in a market bacon hog is very important because a rough or coarse appearance detracts much from the price, and because it is desired that the flesh be fine in texture. In both market hogs and breeding stock, a fine smooth coat of hair denotes quality. Well-developed wrinkles or seams in the skin indicate coarse-grained flesh, and injure the appearance of the finished product. The snout, face, jowl, and ear should show refinement, yet not to an extreme that indicates lack of vigor and feeding qualities. The bone should be flinty and smooth, rather than coarse and rough. Coarse bone is very objectionable because it indicates hard feeding qualities and slow maturity. The butcher prefers a fine boned hog, but the breeder wants the boar to stand on heavy, clean bone covered with skin that shows no coarseness. The brood sow should have finer bone than the boar, but it should be in every way proportionate to her weight, plus the added weight resulting from pregnancy.

Proper **condition** for a market bacon hog is a feature requiring considerable practice in judging. There is danger of too high a degree of fatness, even though the live weight be within the limits that have been mentioned. People who live in the corn belt experience some difficulty in accepting a properly finished market bacon hog as such when first taking up a study of this type. To

them the hog looks considerably underdone. The indications of the proper degree of fatness are difficult to describe. The hog has a well-fed, thrifty appearance, but not a finished look comparable to that of the properly finished lard hog. The flesh is firm and the hog is reasonably well filled out. Soft flesh at the lower part of the hams, at the lower border of the shoulder, or on the jowl, is undesirable because it indicates an over-fat condition and an uneven distribution of the fat. Smoothness and firmness of fleshing are decidedly essential.



FIG. 129.—Bacon type as shown in the herd boar. This Yorkshire boar shows the desired form, smoothness, and quality. Note the clean-cut, trim appearance, light jowl, long smooth side, deep flanks, tapering ham, and large smooth bone.

As indicating the importance of proper feeding and the proper finish, George B. Rothwell states¹ that the feeding of the market bacon hog is almost, if not equally, as important as the breeding. He particularly cautions against overfeeding and recommends that young pigs be kept hungry and that exercise, green feed, and feeds that produce bone and muscle be provided up to four months of age. He states that middlings, shorts, oats, barley, and skim or buttermilk make a desirable ration at this stage, and that corn and barley must be used sparingly, though they may be used more heavily during the last 6 or 8 weeks. He concludes by saying, "Once more and lastly—*avoid overfeeding.*"

¹ Dominion Experimental Farms, Seasonable Hints, No. 24, Nov., 1922, p. 34.

The **style** of the bacon hog should be marked. He should be very active, thus indicating a full muscular development. He should walk without apparent effort. A writhing movement when walking is taken as an indication of weakness in muscling along the back and loin.

The **head** varies in shape a great deal, depending to a large extent upon the breed, but there is also much variation between individuals belonging to the same breed. Length of snout varies with the breed. A long snout is very often associated with a narrow chest, and a very short snout often goes with a heavy jowl and neck. The face should be broad, and the poll should be broad also and come well forward, these being indications of constitutional vigor and feeding qualities. Large, prominent, bright eyes indicate health and constitution. A heavy, fat jowl denotes too strong a fattening tendency for a bacon animal. Good width across the jowl is desirable, but it should be very trim and neat. Size and carriage of the ear vary according to the breed. A large ear does not indicate lack of quality provided it is fine or thin. Thick, coarse ears denote a thick, coarse skin, which, in turn, denotes coarse-grained flesh.

The **neck**, while not a valuable part of the carcass, is important as indicating constitution and feeding qualities. A long, thin neck is an indication of deficient constitution and low feeding qualities; while a short, thick neck, with a crest of fat on top will result in a side of bacon that is too heavy at the fore end, which is the cheap end of the side. Moderate length and width of neck are wanted. It is to be expected that mature boars will have heavier necks than sows or barrows.

The **shoulders** should be light and set in the body smoothly. They should be deep from top to bottom, but not wide from front to rear, and as one looks down on the top of the hog, they should show no greater fullness than the back and loin. Shoulders that have more width from side to side than the rest of the hog are objectionable, but nevertheless should be given preference over a narrow chest in a breeding animal.

The **chest** should be deep, fairly wide, and free from any depression immediately behind the shoulders, and the breast should carry well down between the fore legs and have good width, thus insuring a large chest capacity.

The **front legs** should be rather long, but not extremely so. straight, strong, with upright pasterns, and carrying the weight full on the toes.

A **back** of moderate width, slightly arched from front to rear, and rounded over the top from side to side, represents correct development in this valuable part of the carcass. A sagging back or a decidedly arched back is an evidence of weak muscling and consequently of a lack of lean meat along the top where the highest-priced bacon is found. The top of the hog should show a slight arch from head to tail, the highest point being over the loin. A wide, flat back denotes a high degree of fatness which is not wanted in the carcass of a bacon hog. A very narrow back is an indication of a lack of lean meat.

The **loin** furnishes the most valuable part of the side of bacon



FIG. 130.—Bacon type as shown in the brood sow. The prize-winning Yorkshire sow, Deer Creek Rena 6th, owned by B. F. Davidson, Menlo, Iowa. Note the arch of top, length of side, smoothness of flesh, lightness of jowl, and good udder development.

and therefore should be strongly developed. It should have the same width and form as the back. From shoulder to hindquarter the top of the hog should exhibit a uniform width, uniform arch, and uniform fleshing.

A **side** that is flat, straight, and deep, with a great deal of length, and carrying a firm, smooth covering of flesh is demanded. The packer likes as long a side as can be had, but the breeder must avoid extreme length because such hogs incline to be narrow and shallow bodied. They lack constitution and feeding qualities to such an extent that they do not make economical gains on feed. The side of the bacon hog constitutes the most important consideration in judging either breeding or market animals. Score cards for

bacon hogs allow more points to the side than to any other part of the animal. When the hog is standing, a straight-edge laid against his side, either vertically or horizontally, should touch every point beneath it. There should be no signs of seams or wrinkles, but a smooth development everywhere. The side should also be firm in fleshing, without any softness just behind the shoulder or elsewhere.

The **flank** is important because a high flank injures the appearance of the carcass, necessitates more trimming in order to give evenness to the lower border of the side of bacon, and also is an indication that the belly meat is too thin. When the flank is carried down well, the flesh is usually carried well down on the ham, the belly is thick and meaty, and the development of the side is made more uniform in depth and thickness.

The **belly** should be straight, trim, firm, thick, and free from flabbiness. This part yields good bacon, but it is not so high priced as that from the loin and back.

The **rump** should not be broad and flat, which indicates too much fat, but should have the same width as the back and loin, and should be rounding from side to side across the top, the same as the back and loin. It should be long also, and should round slightly toward the tail, but should not be drooping with the tail set low.

A heavy, bulging **ham** is not an indication of correct bacon type. Such hams must have a great deal of fat trimmed off them in preparing the side of bacon for the market. The ham of the bacon hog should taper toward the hock and should be smooth and firm, especially at the lower part where flabbiness is likely to occur. The flesh should carry well around the bone, inside as well as outside, and should not taper off too suddenly below, but let down well toward the hocks. The ham of the bacon hog is often called the "gammon."

The **hind legs** should be straight and strong, the pasterns upright, and the weight carried full on the toes.

CHAPTER XXIV

THE HOG CARCASS

Comparative study of the importance of the various kinds of meat in American, English, French, and German dietaries discloses the fact that civilization is greatly dependent upon the hog and its products. The following table¹ gives the annual per capita consumption of the various kinds of meat in the four countries mentioned, and shows the large contribution of the hog to the meat supply:

Per capita consumption of meat in various countries

Country and year	Beef and veal	Lamb and mutton	Pork and lard	Total
	Pounds	Pounds	Pounds	Pounds
Argentina (Buenos Aires district), 1928.....	255.1	21.2	36.8	313.1
New Zealand, 1923 ¹	153.0	82.0	26.3	269.6
Australia (New South Wales), 1927.....	123.1	71.6	18.0	212.7
Canada, 1928.....	67.3	6.5	82.5	156.3
United States, 1929.....	58.2	5.8	87.1	151.1
United Kingdom, 1928....	62.1	25.1	46.7	133.9
Germany, 1928.....	40.6	1.6	71.6	113.8
Denmark, 1922.....	57.7	5.9	37.2	100.8
France, 1927.....	45.7	7.3	39.9	92.9
Belgium, 1927.....	42.3	1.3	36.4	80.0

¹ Average per capita consumption for ten-year period ending with 1928.

The British are well known to be partial to beef in their meat dietary, and the Germans to pork, and this is amply substantiated by the table; nevertheless it is seen that the people of the United States consume almost as much beef as the British and more pork than the Germans. The British consume more mutton per capita than any other nationality except the Australians and New Zealanders. The figures show that the consumption of pork, as compared with the consumption of beef, is greater than might be supposed. Americans, Canadians, and Germans consume more pork than beef, but the table shows a different ratio for the seven other countries. These variations may be due to differences in the way appetites have been cultivated in the various countries, or to differences in the quantities of pork produced and the cost of it.

¹ Compiled from U. S. Bur. Agr. Econ., *Foreign Crops and Markets*, July 15, 1929, pp. 95-98, and *Statistics of Meat Production, Consumption, and Foreign Trade of the United States, 1900-1929*, p. 10.

In the total slaughter (federally inspected and all other slaughter) of beef, veal, mutton, lamb, and pork in the United States (excluding lard), beef and veal constituted 42.5 per cent of the total weight in 1929, mutton and lamb only 4.2 per cent, and pork 53.3 per cent.

The type of hogs found in the several countries varies considerably. In the United States the fat or lard type is produced almost exclusively, this being particularly true of the corn belt. The stock yards of this country receive practically no bacon hogs; the St. Paul market is something of an exception, although the number received there is comparatively small. For this reason we shall give more attention to the fat carcass than to the bacon carcass.



FIG. 131.—The hog hoist.

Slaughtering and dressing.—When the hog enters the packing house, and this applies to both the lard hog and the bacon hog, he is driven into a small pen adjacent to a large, slowly revolving wheel, called the “hog hoist,” pictured in this chapter. A chain is fastened about a hind leg and hooked into a link on the wheel. The hog is raised as the wheel turns, until he reaches an overhead inclined rail from which he is suspended and along which he passes to the “sticker.” After bleeding, the hog is dropped into a scalding vat in which the water is kept at a temperature of 142 to 144 degrees F. This loosens the hair and scurf. He is then hooked onto a chain which carries him through a scraping machine, after which he is again suspended from an overhead rail and any spots of hair missed by the machine are scraped by hand and the hair inside the ears and about the face is singed off with a gas torch.

These operations and the subsequent ones necessary to complete the dressing process are briefly as follows: (1) Hoisting, (2) bleeding, (3) scalding, (4) scraping, (5) singeing, (6) removal of head, (7) disboweling, (8) splitting, (9) removal of leaf fat and kidneys, (10) facing hams,¹ and (11) cooling. The carcass remains in the cooler at a temperature of 34 degrees F. for 48 hours before it is taken to the cutting room for division into the wholesale cuts. Nearly all carcasses are cut, and most of the cuts are cured by pickling and smoking before the meat is sold to the retailer.



FIG. 132.—Dressing hogs.

The method outlined above is known as the “packer” style of dressing. The legs, feet, and jowl are left as part of the carcass. An exception is made in the case of pigs and some light hogs intended for the fresh pork trade, these being “shipper” dressed, which means that the head is left on, the leaf fat and kidneys in, the hams not faced, and the backbone not split. Some variation also occurs in the manner of splitting the carcass. All dressed hogs are cut open along the underline and through the aitch bone and brisket, but the best heavy carcasses, called “loin carcasses,” are split through the center of the back bone, while the inferior heavy carcasses, called “packing carcasses,” are sometimes split on one side of the backbone. Bacon carcasses are usually cut with a knife on each side of the backbone and then split on one side and the backbone taken out, making sides suitable for the English bacon cuts.

¹ This consists of smoothing and shaping the ham by trimming off excessive or uneven fat surrounding the split surface or face of the ham.

The offal and the dressing percentage.—The parts which the hog loses in dressing are the blood, hair, head, viscera, leaf fat, kidneys, and ham facings. Hogs having a live weight above 150 pounds and dressed packer style may range in dressing percentage from 65 to 80 per cent. Pigs weighing 30 pounds may dress as low as 60 per cent. Hogs dressed shipper style have a dressing percentage about 8 per cent higher than those dressed packer style,



FIG. 133.—Shipper-dressed carcasses in the cooler.

the difference being due to the head, leaf fat, kidneys, and ham facings, which are not removed in the shipper style of dressing. Heavy hogs dressed shipper style easily dress 83 to 85 per cent. Some hogs in the carcass contests at the International Live Stock Show have dressed as high as 89, 89.3 and 89.6, but these were hogs of show-yard quality weighing 417, 429, and 520 pounds respectively. They had been without feed or water for more than 24 hours prior to killing, and were dressed shipper style. The chief factors determining the dressing percentage of a hog are fatness and paunchiness, of which the former is by far the more important. Dressing percentage is an important factor determining the price of market hogs, though less important than with cattle and sheep because market hogs are more uniform in dressing percentage than market cattle or market sheep. Market hogs of the same weight show much less variation in dressing percentage than do cattle or sheep of a given weight.

Qualifications of a good carcass.—The value of the lard-hog carcass depends upon shape, finish, quality, and weight. The requirements in these respects are as follows:

1. **Shape.**—The most desired carcass is straight and even in its lines, wide in proportion to its length, well developed in the back, loin, sides, and hams, well developed but free from heaviness or coarseness in shoulders and neck, and smooth throughout. A neat, trim carcass is wanted that is free from prominence on the underline. Hence, barrows are always preferred to sows because sows carry more cheap belly meat, this being especially true of sows that have had several litters of pigs. Such sows are called “seedy,” and they bring a lower price than neat trim animals that are smooth

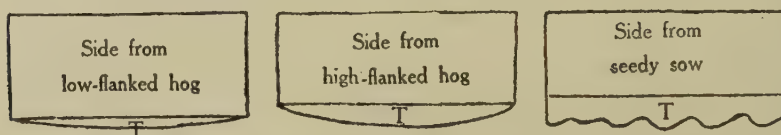


FIG. 134.—Effect of underline on trimming of side. T, trimming.

on the belly. The accompanying drawings show the importance of the underline in determining the value of the side cut from a hog. The trimming from a seedy sow goes to the rendering tank and is made into a cheap grade of lard.

2. **Finish.**—The degree of fatness or finish is shown by the depth of fat along the back, by the quantity of leaf fat, by a plump, full appearance throughout, and by good width of back and side in proportion to length of body. The leaf is the internal fat, including the kidney fat, lying under the ribs and extending to the “skirt” or diaphragm. Packers like hogs well fattened because this means a higher yield of lard and a higher dressing percentage. As a rule, the heavier the hog the more fat he carries, because the nearer an animal approaches maturity the more easily it takes on fat.

That the hog is by nature disposed to take on more fat than any of the other domestic animals is shown by the following table of analyses made at the Rothamsted (England) Experiment Station.¹ After fasting from 18 to 24 hours the animals were killed and the entire bodies analyzed.

¹ Jour. Roy. Agr. Soc. Eng., 1898.

Composition of the entire bodies of meat-producing animals

Animal	Age	Live weight	Protein	Fat	Mineral matter (ash)	Total dry substance	Water	Contents of stomach and intestines—moist
		Lbs.	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Fat pig...	.....	185	10.9	42.2	1.65	54.7	41.3	3.97
Fat sheep.	15 mo.	127	12.2	35.6	2.81	50.6	43.4	6.02
Fat ox....	4 yrs.	1,416	14.5	30.1	3.92	48.5	45.5	5.98
Fat lamb..	6 mo.	84	12.3	28.5	2.94	43.7	47.8	8.54
Fat calf...	8-9 wks.	258	15.2	14.8	3.80	33.8	63.0	3.17

These figures show why the corn crop has formed a closer alliance with hogs than with any other of our domestic animals. The hog is naturally disposed to take on a very high degree of fatness, and hog fat is more valuable than the fat of cattle or sheep. Packers desire a thick covering of outside fat on the carcass of a lard hog, the thickness varying according to the weight of the carcass. Wentworth and Gentry of Armour and Company state¹ that butcher hogs, which are "most sought by the packers at all seasons of the year," should not be "overfinished and extremely lardy, neither should they be so unfinished as to lack the substance, quality, and flavor of cuts the consumer requires."

3. Quality.—The carcass is said to have quality when it is smooth in shape, firm and smooth in flesh, fine and smooth in skin, fine in head and shanks, fine in texture of flesh, bright in color of lean, and white in color of fat. Creases in the skin, bruises, staggy necks and shoulders, and seedy bellies all indicate coarseness. Barrows and smooth, clear sows yield carcasses of the best quality.

Wentworth and Gentry indicate the importance of good finish and quality in the hog carcass in the following comparison:² "The corn-fed hog, hung in the cooler to chill and harden for 48 hours, will come out firm, while the grass-fed hog may be as soft and flabby as when it went in. The corn-fed hog cuts easily and there is a layer of pure white fat on the back. The loin cuts out shapely, and the flesh is pink and fine grained. The ham has the proper depth of fat and the belly has the right thickness and is properly streaked with lean to produce a high-grade bacon. On the other hand, the carcass of the grass hog fails to harden, no matter how long it is chilled; there is a tough rind over the loin and a sheet of

¹ Progressive Hog Raising, Armour and Company, Chicago, 1922, p. 74.

² Ibid., p. 70.

gristly fat. The fat is yellowish and the flesh is stringy. The belly makes a coarse, inferior bacon and the cuts shrink away and present a dried-up appearance when smoked. Furthermore, because of the softness of the carcass, it is difficult to produce the standard cuts, and such cuts as are produced must be sold at a low price or be used for sausage or rendering."



FIG. 135.—Fat and bacon carcasses compared. Note the difference in size, and especially the difference in fatness, between the fat carcass on the left and the bacon carcass on the right.

Soft pork.—Corn, barley, rye, and wheat produce firm pork because the fat has a high melting point. Peanuts, mast, and sometimes soybeans are known to produce soft, oily fat having a low melting point, and hogs fed on these feeds yield soft pork. For this reason hogs from the southern states are often discriminated against in price, sometimes to the extent of 2 to 4 cents per pound live weight.¹ Soft hogs yield inferior lard, usually have a lower dressing percentage, and the percentage of condemned livers, kid-

¹ Progressive Hog Raising, p. 48.

neys, hearts, and casings is reported to be greater. Varying degrees of softness are found. The U. S. Department of Agriculture conducted extensive tests involving 800 hogs and found that the loss in weight from the cooler to the end of the curing and retaining period was over 2 per cent greater in soft pork than in firm pork. Soft carcasses yield cuts of poor shape and the skin shrivels and presents a poor appearance. Hogs that are unthrifty, unhealthy, aged, very immature, or kept under adverse conditions also produce pork that is more or less lacking in firmness.

4. **Weight.**—Packers find uses for carcasses of all weights ranging from 20 to 400 pounds and over, but Wentworth and Gentry state¹ that hogs with a live weight of 190 to 250 pounds yield cuts of the most desired size and weight. All carcasses should be heavy in proportion to their size to insure a high finish and cuts of the best shape.

Classification of Carcasses

The classification and grading of hog carcasses is based on the uses to which they are adapted, or in other words, it is based on the products into which they can be converted. The generally recognized classes and grades and their respective weights are as follows.²

	Carcass weight
Smooth Heavy, or Heavy Loin Carcasses.....	240—400 lb
Butcher, or Light Loin Carcasses.....	160—240 lb
Packing Hog Carcasses.....	Heavy..... Medium..... Light..... Choice..... 240—400 lb 200—240 lb 100—200 lb 120—160 lb
Bacon Carcasses.....	Good..... Common..... 110—170 lb 90—110 lb
Shippers.....	100—200 lb
Pigs.....	20—100 lb

Smooth heavy, or heavy loin carcasses constitute a very small part of the general supply. They are from prime heavy hogs of good quality, either barrows or good clear (not seedy) sows. They have over 4 inches of fat on the back. They yield heavy loins, hams, shoulders, fat backs, and dry-salt bellies, though at times they are cut into the same products as heavy packing hogs.

Butcher or light loin carcasses yield the best loins. A large proportion of the fresh pork sold in retail markets is pork loins, which are cut into chops and roasts. Only the best carcasses weighing 160 to 240 pounds from barrows and smooth clear sows

¹ *Progressive Hog Raising*, p. 70.

² Louis D. Hall: *Market Classes and Grades of Meat*, Ill. Bul. 147, pp. 252-288.

classify here. The covering of fat on the back should be from 2 to 4 inches in thickness. The carcass is cut into the regular American or lard-hog cuts. (See Fig 136.) The bellies are sweet pickled and the lighter and leaner ones are smoked and sold as breakfast-bacon bellies.

Packing hog carcasses constitute about one-half of the hog carcasses in Chicago packing houses. These are inferior carcasses of all weights ranging from 100 pounds upwards. They are coarse,

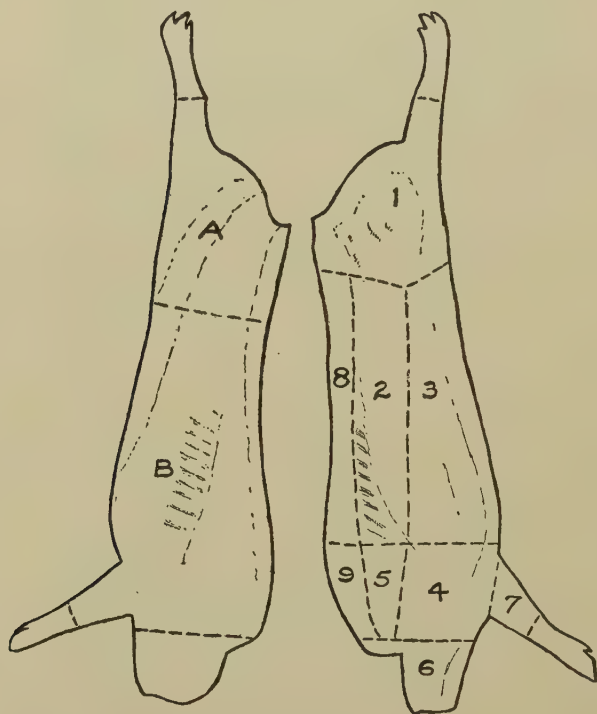


FIG. 136.—Wholesale cuts of pork.

English cuts.—A, Long-cut ham; B, long side or middle.

American cuts.—1, Ham; 2, loin; 3, belly; 4, picnic butt; 5, Boston butt; 6, jowl; 7, hock; 8, fat back; 9, clear plate; 2 and 8, back; 2, 3, and 8, side; 4 and 7, picnic shoulder; 5 and 9, shoulder butt; 8 and 9, long fat back; 4, 5, 7, and 9, rough shoulder.

rough, and unevenly finished. They are not well adapted for fresh pork products or smoked meats, and the sides are therefore principally packed as mess pork, barreled pork, and dry-salt meats. In times of scarcity, however, the sides are cut into loins, fat backs,

and bellies, the same as butcher hogs. This is more often true of the light and medium-weight packing carcasses than of the heavy ones. The hams are sweet pickled and the shoulders made into picnics and Boston butts.

Bacon carcasses are the lighter, thinner carcasses suitable for sugar-cured breakfast-bacon bellies and English cuts, so called because they are suitable for the English trade. The principal English cuts are Wiltshire sides, Cumberland sides, and long-cut hams. The Wiltshire side comprises the entire side (half the hog), minus the head, shanks, shoulder blade, and hip bone. The belly is trimmed smooth and even. These sides average 40 to 70 pounds and are selected especially for thickness of lean meat and a light, even covering of fat from 1 to 2½ inches thick, not exceeding 1½ inches in the best grade. They are made exclusively from choice, lean bacon hogs. Fig. 136 shows a bacon side and indicates its division into the long-cut ham and the long-cut middle or Cumberland.

Shippers are similar to butcher hog carcasses in shape and quality, but are lighter in weight and generally not so highly finished. They are used for the fresh retail trade, and they must be fancy in quality. They are extensively sold as whole carcasses and are shipped in carlots to eastern points, the greatest demand being in the winter months.

Pigs are carcasses of light, young hogs that are comparatively lean and weighing from 20 to 100 pounds. They are dressed and sold like shippers. Roasting pigs are dressed suckling pigs which are fat and smooth. They are sold like winter lambs direct to hotels and restaurants. The most desired weight is 15 to 20 pounds, but pigs weighing 30 pounds are used.

Wholesale cuts from the lard hog.—After the carcass has been thoroughly chilled it is cut up into shoulders, hams, fat backs, loins, spare ribs, and belly. These wholesale cuts are shown in the drawings which accompany this chapter. (See Fig. 136.)

The part labeled "fat back" is a clear layer of outside fat containing no lean meat. Studies of the carcasses of cattle and sheep disclose the fact that it is easily possible to feed a steer or a wether too long, and thus make the animal too fat to suit the consumer. One-half to three-fourths of an inch of outside fat is all that is wanted on the carcasses of cattle, and for mutton and lamb the

desired thickness is proportionate to the requirements for cattle. With fat hogs we find an entirely different state of affairs, for the packer wants a thick layer of fat over the top of the hog. This heavy layer of fat constitutes a separate cut known as the fat back, which may be rendered into lard, or dry salted and sold as a dry-salt cut. When manufactured into lard they render 85 to 88 per cent. About one-half of them are sold as a dry-salt cut for which a demand exists in the South and in Europe. Lard is more valuable than tallow, hence the difference in the packer's attitude toward high finish in the lard hog as compared with a similar degree of fatness in cattle or sheep.

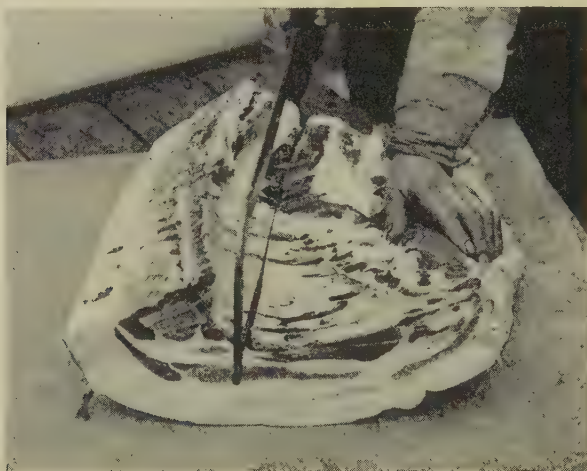


FIG. 137.—A side of pork. Sawing through ribs preliminary to cutting into loin, fat back, spare ribs, and belly. The thick layer of clear fat covering the loin is the fat back. The belly is streaked with lean. The spare ribs are trimmed from the belly. The front or shoulder end of the side was toward the camera.

The belly contains streaks of lean and is suitable for a "breakfast bacon belly" if the cut is from a light-weight hog. If the hog is heavy, the belly cut is dry salted or pickled and is known as a "dry-salt belly" or as a "sweet-pickle belly," and these sell at lower prices.

Mr. L. D. H. Weld, of the Commercial Research Department of Swift and Company, Chicago, has supplied the writer with the following table showing the relative weights and values of the green (fresh or uncured) cuts from a 250-pound hog. The prices are those prevailing in March, 1923.

Green (fresh) cuts from a hog having a live weight of 250 pounds

Wholesale cuts	Per cent of live weight	Market price of green cuts per pound Cents	Value per cwt. of live hog
Regular hams	13.75	15	\$2.06
Skinned shoulders	10.00	10	1.00
Jowl	3.00	8½	.26
Bellies (square cut and seedless).....	12.50	13	1.62
Fat backs	10.00	9	.90
Spare ribs	1.00	7½	.07
Loins	10.00	13	1.30
Miscellaneous ¹	3.00	5	.15
Leaf fat (unrendered)	3.00	10½	.32
Cutting fat (unrendered) ²	6.00	7	.42
Heads	4.50	3½	.16
Total	76.75		8.26

¹ Includes feet, neck bones, tail, and a small amount lean trimmings.

² Includes small fat trimmings from hams, fat backs, bellies, and other cuts. It is rendered into lard.

High-priced and low-priced cuts.—There is somewhat less variation in the prices of the wholesale cuts of pork than is true of beef, mutton, or lamb. The loin, rib, and round of the beef carcass constitute 50 per cent of the carcass weight and 66 per cent of the total value. The ham, loin, and belly of the 250-pound lard hog constitute 47 per cent of the carcass weight and 60 per cent of the total value. All of the larger cuts—hams, shoulders, bellies, fat backs, and loins—sell readily at good prices, whereas it is difficult to dispose of some of the cheaper cuts from cattle and sheep. A study of the swine carcass emphasizes the importance of good development in all parts of the hog, though more especially in the back, loin, sides, and hams.

Weights of finished products.—The table and chart, shown on next page, from Swift and Company's 1922 Year Book, show the weights of the finished products from a 250-pound hog.

Cured pork products.—Only about 1 or 2 per cent of the hogs slaughtered by the large packing houses are sold as whole carcasses. About three-fourths of the wholesale trade in pork consists of various cured meats and fresh cuts, the remainder consisting principally of lard and a small percentage of sausage and canned meats. Only about 20 per cent of the domestic trade and 5 per cent of the export trade in pork products, other than lard, consists of fresh meat.¹ The various curing processes perfected by American packers enable them to store a large amount of pork during the winter season of heavy receipts for disposal in seasons of light receipts. Some of the time in storage is consumed in curing. Pick-

¹ Ill. Bul. 147.

ling requires from 30 to 100 days, and the subsequent smoking requires from 2 to 8 days.¹ In this respect pork has a decided advantage over beef and mutton which are sold almost entirely in the fresh state, and the hog market is stabilized to some extent as a result of it.

The only pork cuts sold extensively as fresh cuts are loins, tenderloins, and spare ribs. Some hams and shoulders are also sold in the fresh state. Following are brief discussions of the various curing processes:²

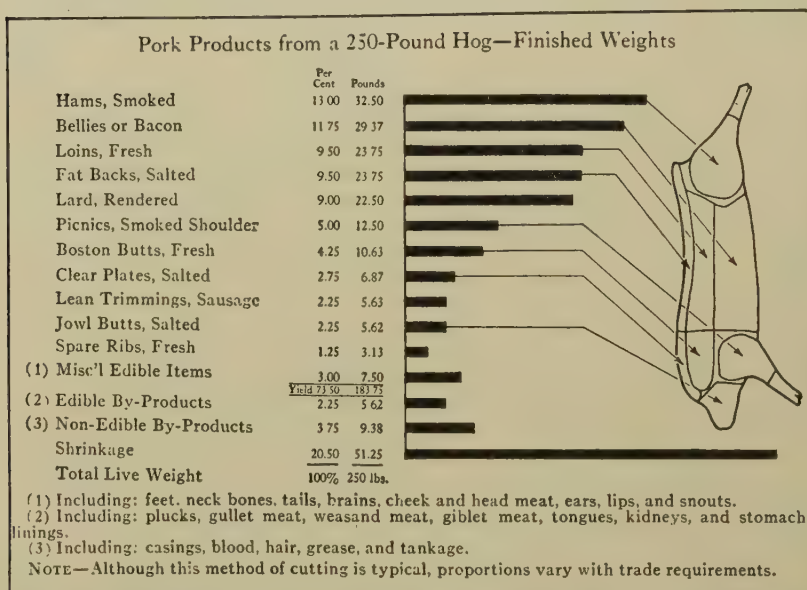


FIG. 138.—Weights of the finished wholesale cuts from a 250-pound hog.

Mess pork, which is made from packing hog carcasses, is a simple method of packing cheap pork and was much used in the early days of the packing industry. It is prepared by cutting the side into strips about six inches wide and packing in salt brine (to which is added 12 ounces of saltpetre per barrel) in tight barrels (18 x 29 inches) at 200 pounds net weight of cured pork per barrel or 355 pounds gross. It is shipped principally to the southern states, northern lumber camps, and South America.

Barreled or plain-pickled pork is similar to mess pork except

¹ *Progressive Hog Raising*, p. 84.

² Ill. Bul. 147.

that more salt is used and no saltpetre is added. It consists of mess, fat back, and belly pork.

Dry-salt meats, the other common product of packing carcasses, are heavy sides, bellies, shoulders, fat backs, and jowls cured in dry salt, pumped (injected) with brine, and shipped in coarse salt. They are usually shipped loose, but sometimes are put up in boxes containing 25 to 500 pounds.

Sweet-pickled meats are cured in sweet brine containing syrup and saltpetre. The bulk of sweet pickled and other sugar-cured meats are smoked after curing.

Smoked meats are cured in sweet pickle or in dry salt and sugar, and are then smoked after curing. Hams and picnic shoulders from all classes of hogs are generally sweet pickled and smoked. Bacon meats and bacon bellies are either dry salted or sweet pickled prior to smoking. The best of these are breakfast bacon bellies which are dry cured and smoked lightly.

English meats are principally cuts from bacon hogs and are dry-cured in English salt and saltpetre and then packed in borax or salt for export, chiefly to Great Britain. The principal cuts handled in this way are long bacon sides, long-cut hams, clear¹ backs and bellies, and square shoulders. After shipment abroad they are generally dried or smoked lightly before they are sold at retail.

Boiled meats are rolled boneless cuts, including hams, picnic shoulders, and loins, cured in sweet pickle, cooked in water, and lightly smoked. They are made principally from heavy hogs.

The United States Census of 1920 reported the total value of the products of slaughtering and meat packing in the United States to be \$4,283,416,521. The following list of these products is of interest as indicating the importance of pork and the relative value of cured pork and cured beef:

¹ Backbone and ribs removed.

Value of meats and meat products produced in United States in 1919

Product	Value	Per cent of total value
Fresh meat:		
Beef	\$846,794,386	19.8
Veal	83,912,942	2.0
Mutton and lamb	120,338,355	2.8
Pork	532,669,835	12.4
Cured meat:		
Beef	28,359,892	.7
Pork	1,217,589,927	28.4
Canned goods	96,904,341	2.3
Sausage	173,587,401	4.0
Lard	415,817,212	9.7
Lard compounds and substitutes	123,724,098	2.9
Oleo oil	31,212,708	.7
Other oils	9,153,123	.2
Tallow and oleo stock	36,276,065	.8
Stearin	8,999,349	.2
Oleomargarine	36,777,815	.9
All other products	521,299,072	12.2
Total	\$4,283,416,521	100.0

The Grades of Lard¹

From one-tenth to one-third of the hog carcass is made into lard in large packing houses, the proportion varying with the relative price of lard and grade of hogs. Lard is sold under six different names representing differences in whiteness, grain, flavor, and keeping qualities. Lard is made from leaf fat, fat backs, and fat trimmings from ham, shoulder, belly, jowl, and head. The highest grade of lard is Kettle Rendered Leaf Lard, made from leaf fat. It is very white in color and finest in grain and flavor of all grades of lard. Then there is Kettle Rendered Lard made mostly from fat backs, with perhaps a small addition of leaf fat. Fat trimmings are also used at times. It ranks second only to the preceding grade. Neutral Lard is made from leaf or back fat at a lower temperature than is required in the manufacture of kettle rendered leaf lard. No. 1 Neutral Lard is made from leaf fat only. It is tasteless, free of acids and impurities, smooth grained, and remains unchanged in odor and color. No. 2 Neutral Lard is made from back fat. It is not as white in color nor as fine in grain as No. 1 and sells at a lower price. Ninety per cent or more of the lard made at Chicago is known as Prime Steam Lard. It is made from fat trimmings and internal fats. It is darker colored and coarser grained than other grades and is the form in which hog fat can be most economically stored and shipped. It is refined before using. Then there is Refined Lard made from prime steam lard

¹ Ill. Bul. 147.

by a bleaching and stirring process. Also there is Compound Lard or Lard Compound, which is a mixture of lard, stearin or other animal fat, and vegetable oil, usually cottonseed oil.

By-Products of the Hog

A larger percentage of the hog is edible than of any other meat animal. This statement includes both the carcass and the edible by-products. The hog also has a higher dressing percentage than any other meat animal, and the percentage weight of the offal (edible and inedible) is correspondingly less. The value of the offal from hog slaughter, including lard, is much less in proportion to the live value of the animal than it is with cattle or sheep.

Edward N. Wentworth, director of Armour's Livestock Bureau, states¹ that the edible by-products of the hog, excluding lard, average about 2.25 per cent of the live weight, that the inedible by-products average about 3.75 per cent, and that shrinkage in slaughtering and processing averages about 20 per cent.² He states that heavy hogs shrink about 19 per cent and light hogs about 22.5 per cent in slaughtering and processing. The average value of inedible by-products derived from 6,673,657 hogs slaughtered at Armour's plants from November 1, 1918, to November 1, 1919, was only 14 cents per head, whereas the value of the carcass and edible by-products, including lard, amounted to an average of \$43.41 per head.

Mr. Wentworth has supplied the writer with the following list of the by-products of hog slaughter and their values on April 9, 1923. The values represent averages of all hogs killed that day by Armour and Company. Their average live weight was about 240 to 245 pounds, their average price was about \$8 per cwt., and their average live value per head was about \$19.20:

¹ Monthly Letter to Animal Husbandmen, The Source and Use of Packing House By-Products, Armour and Company, Chicago, Aug. 1, 1920.

² This includes contents of stomach and intestines, loss of weight by evaporation of moisture, and waste in manufacturing.

Values of offal (by-products) from average of all hogs slaughtered by Armour and Company, Chicago, on April 9, 1923

Edible by-products	Total value	Inedible by-products	Total value
Leaf lard	\$.5569	Ear drums ¹	\$.0053
Livers	.0274	B. W. grease ¹	.0763
Hearts	.0074	Nasal tips ¹	.0015
Kidneys	.0095	Grindings	.0022
Giblet meat ¹	.0093	Viscera (condemned)	.0115
Tongues	.0834	Heads (condemned)	.0006
Cheek meat	.0291	Pressed tankage ¹	No value
Jaw meat	.0036	Dry blood ¹	No value
Brains	.0090	Hair and bristle	.0225
Prime steam lard	.4756		
Casings	.0300		
		Total inedible	.1199
Total edible	1.2412	Total by-products	1.3611

¹ Giblet meat is lean trimmings from the skirtings (diaphragm), gullet, etc. "B. W." is the first grade of brown grease. Ear drums are sent to the glue works. Nasal tips are rendered for "A White" grease. Pressed tankage and dry blood had no value on this date because they cost as much to produce as could be realized for them on the market.

As shown above, the total value of all by-products was \$1.36. This is only 7.09 per cent of the cost of the live hog. The value of the lard amounted to \$1.03, or over 75 per cent of the value of all by-products. All by-products other than lard had a value of only 33 cents.

Among the edible by-products of the hog are pepsin, derived from hog stomachs; livers, used in the manufacture of liver sausage; and neutral, a specially prepared lard, largely used as an ingredient of oleomargarine. Lard proper is not commonly considered a by-product; it is one of the primary products of hog slaughter. Nearly 15 per cent of the live weight goes into lard. Part of this lard is further processed into lard oil and lard stearin. Lard oil is used for illuminating purposes and as a lubricant. Stearin enters into the manufacture of chewing gum and soft candies.

Brains are packed in cans, frozen, and offered for sale. Tongues are canned or pickled. Hearts go into sausage. Tails, snouts, and ears are rich in gelatin or glue. Kidneys are canned or frozen. Milts or spleens are used as a feed for growing fishes at fish hatcheries. The intestines are cleaned, processed, and made into chitterlings, a food product to be fried like oysters. Stomachs are used as sausage containers. Something like 7 per cent of the weight of the hog is represented in inedible by-products in the raw state which are manufactured into glue, soap, glycerine, blood meal, tankage, curled hair, and fertilizer material. Even the rinds from skinned hams and bacons, as well as the back skin of the hog, are utilized for leather. Nothing is wasted.

Conclusions

The following conclusions may be drawn from the study of the hog carcass, its various products, and the by-products of the hog:

1. In order to bring the highest market price, lard hogs must be fat, smooth, free from paunchiness, and straight and trim in the underline.

2. The lard hog should be well developed in all parts, though more especially in the back, loin, sides, and hams.

3. Barrows and young, smooth sows yield the best carcasses. Carcasses of boars and stags are coarse throughout and are especially heavy and coarse in neck and shoulders. Sows with seedy bellies are discriminated against.

4. Hogs with a live weight of 190 to 250 pounds yield cuts of the most desired size and weight, but weights up to 300 pounds are in good demand.

5. Any kind of a hog finds a buyer on the market, but the price paid depends upon the kind of carcass the hog will yield. The by-products of the hog are of little value and are a very minor factor in live prices.

6. The curing and storing of large quantities of pork by packers makes pork products readily available in seasons when the supply of live hogs is limited, thus tending to increase the total yearly consumption of pork and to widen the market for live hogs.

7. Curing and storing enable packers to more readily absorb large runs of hogs and tend to sustain live prices in seasons of large receipts.

8. The development of the packing industry has made an outlet for the plainer sorts of hogs which otherwise would be a drag upon the market.

9. No other kind of meat comes so nearly being manufactured by packers as does pork.

10. No other animal equals the lard hog in its fat-storing ability.

11. The production of lard hogs furnishes a logical channel of disposal for corn, because corn is a fattening feed and lard brings a higher price than tallow.

12. Indian corn and the American packing industry have combined to develop the American hog industry into a business of mammoth proportions. Corn, properly supplemented, makes pork economically, and pork finds ready sale because packers have discovered many ways of placing pork on the market in attractive and highly palatable form combined with most excellent keeping qualities.

CHAPTER XXV

HOG MARKETS AND PORK PACKING—PAST AND PRESENT

Hogs are marketed by the same methods and are shipped to the central markets and sold in the same manner as cattle, as described in Chapter V. In addition it may be mentioned that local auction sales in some of the western states serve as a means of marketing a considerable number of hogs.¹ Throughout the country there is more selling of hogs at country points direct to packers than of cattle or sheep.

C. A. Burmeister of the U. S. Bureau of Agricultural Economics states² that in 1928 the proportion of direct purchases in the total bought by wholesale slaughterers in this country had increased to more than 34 per cent, as compared to 24 per cent in 1922. He states that in Iowa, where approximately one-fourth of the commercial supply of hogs is produced, about one-half of the hogs marketed are now sold direct as compared with one-third in 1920. The proportion of hogs slaughtered on farms far exceeds that of cattle or sheep.

The large markets.—Most of the large hog markets of the United States are located in the corn belt. The 13 largest markets and their receipts in three years, as reported by the U. S. Bureau of Agricultural Economics, are as follows:

Receipts of hogs at leading markets in three years

Market	1929	1928	1927
1. Chicago	8,192,951	8,539,405	7,724,216
2. St. Louis	3,865,456	4,036,266	3,710,104
3. Omaha	3,165,793	3,179,211	2,630,731
4. St. Paul	2,868,883	2,902,448	3,104,933
5. Kansas City	2,476,307	2,391,016	1,903,640
6. Sioux City	2,313,212	2,753,953	2,322,404
7. Indianapolis	2,145,407	2,260,804	1,840,841
8. Pittsburgh	2,040,910	2,201,813	2,136,132
9. St. Joseph	1,626,641	1,724,011	1,425,432
10. Baltimore	1,093,031	1,199,208	1,010,091
11. Cincinnati	855,764	1,567,309	1,253,083
12. Buffalo	853,982	1,025,769	1,067,020
13. Wichita	832,637	798,691	605,825
Totals	32,330,974	34,579,904	30,734,452

¹ The California Farm Bureau Marketing Association sold 2,175 carloads of hogs at auction during the four years ending October 1, 1922. These were sold at 699 sales in 7 counties.—U. S. Dept. Agr., Agricultural Cooperation, Jan. 2, 1923.

² U. S. Dept. Agr. Yearbook, 1930, pp. 323-325.

Sixty-five markets received 43,564,383 hogs in 1929. The 13 markets listed in the foregoing table received 74 per cent of this total.

The Chicago market.¹—As shown by the above figures, Chicago is in a class by itself as a hog market. It receives more than twice as many hogs as St. Louis, its nearest rival. The total value of the hogs received at Chicago in 1929 was \$195,491,005. Their average value per head was \$23.85. Their average live weight was 238 pounds. Their average price per cwt. was \$10.05. Of the 8,192,951 hogs received at the Chicago yards during 1929, 6,361,707 were slaughtered by Chicago packers, 1,830,848 were shipped out alive to other points for slaughter, and 396 were shipped out for feeding. In addition to the hogs included in the above figures, small packing firms at Chicago, located outside the yards, received direct and slaughtered 960,029 hogs in 1929.

The growth of the Chicago market is shown by the following list of receipts and shipments of hogs at that point during the years mentioned:²

Movement of hogs at Chicago

Year	Receipts	Shipments	Year	Receipts	Shipments
1858	540,486	192,013	1880	7,059,555	1,394,990
1860	392,864	227,164	1890	7,663,829	1,985,700
1866	961,746	482,875	1900	8,109,064	1,452,183
1870	1,693,158	924,453	1910	5,586,858	1,202,390
1875	3,912,110	1,582,643	1920	7,526,120	1,656,528

It is interesting to note that the advent of the refrigerator car, about 1875, had a marked effect on the proportionate number of hogs shipped. The largest number of hogs received at the Chicago yards in a year was in 1923, when 10,460,134 head were received at the yards proper. If receipts by outside packing firms are included, the figure is raised to 11,031,367. The highest record for a month is credited to December, 1924, when 1,436,029 hogs were received at the yards and enough by outside packers to make the total 1,530,574. The record week was that ending December 6, 1924, when 384,295 were received at the yards, and 402,147 in all. On December 15, 1924, the largest day's receipts were recorded, the figures being 122,749 and 128,859 respectively.

The number of hogs marketed annually varies greatly. This

¹ Drovers Journal Year Book of Figures for 1929.

² Compiled from U. S. Dept. Agr. An. Rpt., 1863, p. 208; Drovers Journal Year Books of Figures.

fluctuation is caused partly by losses from disease, and partly by the fact that if an unexpected or temporary demand springs up, and higher prices rule, great numbers of hogs of inferior size and weight are rushed to market.

Charges for commission, yardage, and feed.—At Chicago the charge for the yardage of hogs is 12 cents per head. Commission charges for selling hogs are as follows: Hogs in car lots, single deck, 50 head or less, \$13, and 15 cents per head for each additional head over 50 head, with a maximum of \$15; double deck, 80 head or less, \$18, and 15 cents per head for each additional head over 80 head, with a maximum of \$23. Less than 40 hogs shipped in one car, 30 cents per head. Public inspection of hogs costs 25 cents per car. Corn costs \$1.60 per bushel.

Shrinkage of hogs in transit.—Hogs usually shrink from 2.5 to 4 per cent in shipment to market.¹ These percentages express the difference between home weights and selling weights. The latter include the "fill." Hogs shrink less than cattle or sheep in shipment.

The fill.—Upon arrival in the pens at the market, hogs are given shelled corn and water. This constitutes the "fill." It has a quieting effect, improves the appearance of the animals, and increases the weight. A test at the Kansas City market is reported² in which 44 cars of hogs made gains ranging from 290 to 1,380 pounds per car and averaging 6.23 pounds per head on the usual fill of corn and water. This was the increase in weight as shown by weighing the hogs on their arrival at the yards and again after feeding and watering.

Seasonal variations in receipts and sale of hogs at Chicago.—Fig. 139 shows the average monthly receipts of hogs at Chicago for ten years. Largest receipts occur in November, December, January, and February, especially in December and January. Smallest receipts occur in August and September. Over twice as many hogs are received in January as in September. A marked rise in receipts begins in October and continues into February, followed by a decline during late February, March, and April. A smaller rise occurs in May and June, followed by a progressive decline during July, August, and September. The number of hogs marketed monthly varies much more widely than that of cattle or sheep.

¹ Wentworth and Gentry: *Progressive Hog Raising*, 1922, p. 79.

² Arthur C. Davenport: *The American Live Stock Market—How It Functions*, p. 47.

The large winter receipts are due to the marketing of the pig crop of the previous spring. The smaller bulge in May and June results from the marketing of considerable numbers of hogs that were farrowed in the previous fall, of which a much smaller number are raised than of spring pigs.

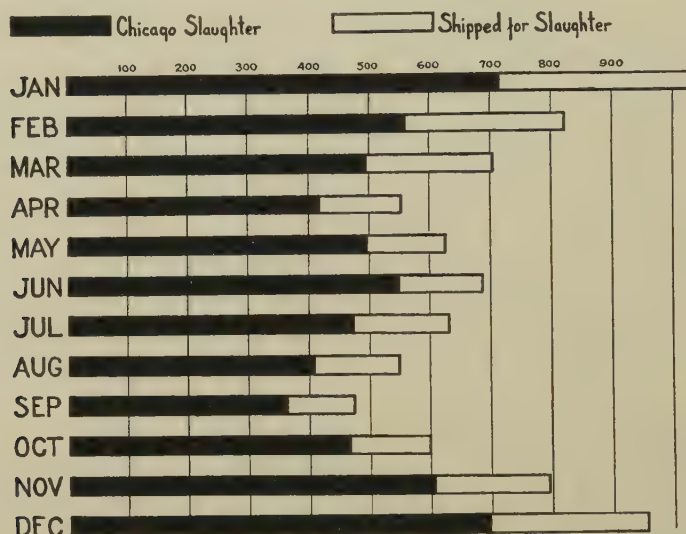


FIG. 139.—Average monthly receipts and shipments of hogs at Chicago in thousands for ten years, 1920-1929. The total length of each bar represents average monthly receipts. The divisions of the bar represent the average number of Chicago hogs sold monthly for local slaughter and for shipment to other points for slaughter. The average number shipped monthly for feeding is too small to be shown in the chart.

The chart shows that most of the hogs received in each month at Chicago are slaughtered there. A yearly average of 25 per cent are shipped to other points for slaughter. Only a very small number are shipped for feeding, too few to represent graphically in the chart. (Compare this chart with similar charts on pages 84 and 252.)

Weights of hogs at seven markets.—There is considerable difference in the yearly average weights of the hogs received at various markets. Omaha and Sioux City receive heavier hogs than Chicago, while those received at St. Louis, St. Paul, and Kansas City average lighter:¹

¹ Drovers Journal Year Books of Figures.

Yearly average weights of hogs at seven markets for ten years

Market	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	Ten-year average
Omaha	254	254	261	258	243	245	256	256	257	246	253
Sioux City ..	253	257	260	240	236	243	256	259	252	246	250
Chicago	238	236	240	249	237	235	238	240	236	237	239
St. Joseph ..	232	237	240	241	229	231	233	235	235	235	235
Kansas City ..	231	235	235	237	233	225	218	213	225	218	227
St. Paul	234	225	217	215	218	213	214	221	212	218	219
St. Louis ...	204	205	208	212	211	200	186	181	185	183	197
Gen'l. average	235	235	237	236	229	227	229	229	229	226	231

The yearly average weight of market hogs varies in response to the relative price of hogs and corn. When hogs are relatively scarce and high in price, and corn is plentiful and cheap, hog growers feed more heavily during the fattening period, feed for a longer period, and send their hogs to market at a greater age and weight and carrying a higher finish than usual. As a rule, heavy yearly average weights indicate the years in which pork production was most profitable, and *vice versa*.

Chicago monthly average weights.—Following are the monthly and yearly average weights of hogs received at Chicago for ten years. The highest monthly average of each year is printed in bold type and the lowest monthly average is enclosed in parenthesis. At the right of the table are the monthly averages and the general average for the entire ten-year period:¹

Monthly and yearly average weights of hogs at Chicago for ten years

Month	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	Ten-year average
January	230	(229)	233	241	226	230	235	(229)	229	229	231
February	229	232	232	240	(222)	229	(234)	232	230	231	231
March	239	236	241	247	228	234	239	240	238	237	238
April	242	234	242	248	233	234	239	242	237	243	239
May	240	231	244	251	235	236	237	241	238	239	239
June	245	233	246	255	237	237	240	241	238	236	241
July	254	239	246	261	243	239	241	246	240	242	245
August	256	244	253	272	249	242	242	255	251	250	251
September ...	246	242	254	263	250	244	244	250	250	248	249
October	238	241	241	245	246	236	239	241	235	236	240
November	(228)	236	(227)	235	241	229	235	232	(223)	(224)	231
December	(228)	231	(227)	(230)	239	(227)	(234)	233	225	228	(230)
Yearly average	238	236	240	249	237	235	238	240	236	237	239

In six of the ten years and in the ten-year averages, August weights are heaviest. December weights average lightest. The

¹ Compiled from Drovers Journal Year Books of Figures.

light November average is due to the fact that spring pigs then first appear in relatively large numbers, and these continue to arrive in large numbers during December, January, and February. Heavy weights in July, August, and September are due to the holding back of young hogs in the country until the corn crop is matured and used for fattening. Relatively few hogs are received during August and September but the receipts include a larger proportion of aged hogs than in other months, the result of marketing brood sows that were culled and fed after spring litters were weaned. The ten-year averages show that the average weight



FIG. 140.—Unloading hogs at Chicago.

of market hogs rises from December to March, but remains almost constant during March, April, and May. Fall-farrowed pigs arrive during April and May in sufficient numbers to prevent an appreciable rise in weight during those months.

Docking or shrinking weights.—At central markets stags are docked 70 pounds, and pregnant sows 40 pounds each. The excuse for this practice is the greater amount of waste in killing and dressing such hogs, but boars are not docked. Formerly stags were docked 80 pounds. On some markets small pregnant sows are docked less than 40 pounds. Small stags should be docked less than 70 pounds, but are not. The decision as to what hogs are stags and what sows are pregnant rests with inspectors employed jointly by commission men and packers who inspect the hogs as they are driven from the scales. All dockage is deducted from the gross weight of the drove, which is the basis of payment for the hogs.

This system has been in use at Chicago since 1884, and is the result of joint agreement between hog buyers and commission firms.¹ In case either party is dissatisfied with the amount of dockage, he may appeal to the chief inspector or shrinker whose decision is usually accepted as final. If it is not accepted, a committee composed of one buyer, one salesman, and a third party selected by them, renders a decision that is final.

P. H. Hamilton, of Woodbury County, Iowa, states² that hog dockage was probably the principal reason for the organization of live-stock exchanges at the markets, and that there have possibly been more wordy battles and more fistic encounters over the dockage of hogs than over any other one thing in the hog trade. He states that the amount of trimming necessary to remove the gristle (shields) on the shoulders and belly (sides) of the stag explains the dockage of stags. He mentions that alfalfa, grass, and soft corn will make even barrows look like "piggy" sows. He also states, "There has been many an instance recorded at the Sioux City market where the buyer has got the committee on hog dockage together, and lo and behold, when he returned he found that the sows in dispute had farrowed their pigs."

The Pork-Packing Industry

During the first half of the nineteenth century, Cincinnati was the leading pork-packing center of this continent, and this position was maintained until 1863, at which time Chicago took the lead. One by one, other western cities have crowded ahead of Cincinnati until now her rank is thirteenth in the list of American hog-packing centers. That Cincinnati's supremacy was not a permanent one was due to the fact that until the West was settled, live-stock conditions were very unstable, and the logical packing center in 1850 was found to be too far to the east of the center of hog production as it existed twenty years later. With the settling of the corn belt and the rapid extension of the hog's domain to the westward, Chicago was enabled, by virtue of her location and direct railway connections with the heart of the corn belt, to gain and hold supremacy as a pork-packing center. The evolution of the gigantic pork-packing business of the United States may be told in brief by first reviewing the growth and development of the business at Cincinnati, and then following it to Chicago at the close of the Civil War.

¹ The American Live Stock Market—How It Functions, p. 54.

² Breeder's Gazette, Jan. 27, 1921, p. 155.

Early packing at Cincinnati.¹—In 1833 Cincinnati packed 85,000 hogs. Five years later the number packed in the year had risen to 182,000 head. In 1843 no less than 250,000 hogs were consumed by the numerous packing establishments then doing a thriving business at Cincinnati, and the town was dubbed "Porkopolis," which name was formerly in general use, but is now nearly obsolete. Cincinnati slaughtered 360,000 hogs for packing purposes in 1853, and in 1863 the number packed was 608,457. The demands of the army were largely accountable for the large number packed during the last mentioned year. The average price of hogs at Cincinnati was \$5.75 in 1855, \$6.21 in 1860, and \$3.28 in 1862, but the Civil War caused a rise to \$14.62 in 1865, followed by a decline to \$11.97 in 1866 and to \$6.95 in 1867. Present-day pork producers who experienced a similar slump in prices during 1920 and 1921 following the World War can testify that history repeats itself.

In early times Cincinnati was especially favored as a pork-packing center because of its shipping facilities, large quantities of cured pork being shipped to southern points in flat boats via the Ohio and Mississippi rivers. The South took most of the product, though New England and eastern points took a considerable share. Lard was exported to the West Indies, England, and France. Cincinnati was also favored in that prior to the Civil War it was the center of the finest hog-raising region in the world, including the states of Kentucky, Ohio, and Indiana. It was in this favorable environment and under the stimulus afforded by a large, near-by market that the Poland-China breed originated during the period mentioned. Although Chicago took the lead in the number of hogs packed following the war, Cincinnati continued to hold first place for a considerable time so far as the quality of hogs packed was concerned. In 1866 there were 15 slaughter houses at Cincinnati, some of which employed as many as 100 hands. One concern slaughtered 60,000 hogs during that year. Measured by the standards of the time, these Cincinnati packing establishments were considered to be gigantic in proportions. In 1866 Cincinnati produced 180,000 barrels of pork, 25,000,000 pounds of bacon, and 16,500,000 pounds of lard.

¹ H. D. Emery: Hogs and Pork Packing in the West, U. S. Dept. Agr. An. Rpt., 1863; Charles Cist: The Hog and Its Products, U. S. Dept. Agr. An. Rpt., 1866.

Development of packing at Chicago.¹—The earliest packing or slaughtering done in Chicago was in 1827; in that year Archibald Clybourn erected a slaughter house for the special purpose of supplying the garrison at Fort Dearborn. The trade was mostly local until 1833, when immigration set westward quite strongly, creating a larger demand. During 1835, Mr. Clybourn packed about 3,000 hogs, besides considerable beef, for which a ready market was at hand. This stock had to be picked up at long distances from Chicago and driven on foot to the city. Other men soon engaged in the business which took on larger proportions, the surplus product finding a market in the East. The slaughter houses were mostly located on the south branch of the Chicago river, and into it the offal and filth were drained, which in later years became a nuisance and was prohibited by the city. In 1863 there were 58 different establishments in Chicago doing a general packing business. During the winter of 1853-'54, Chicago packed 52,849 hogs, and in 1860-'61 the number packed was 231,335.

During the winter packing season of 1863-'64, the rank of the largest packing centers and the number of hogs packed by each was as follows: (1) Chicago, 904,159; (2) Cincinnati, 400,000; (3) St. Louis, 200,000; (4) Louisville, 103,996.

By-products from early hog packing.—The Report of the U. S. Department of Agriculture for 1866 contains an account of early hog-packing operations which is of interest for comparison with modern methods of utilizing all of the by-products of the hog. The following, written by Charles Cist, of Cincinnati, appeared in the report for that year:

"I have referred to the remarkable fact, that there was a period in the West when corn would not, in some sections, command six cents per bushel, and in others was of so little value as to be substituted for wood as fuel. Not less extraordinary is the fact, within the knowledge of hundreds now in Cincinnati, that in the early ages of pork packing, say in 1828, there was so little demand for any portion of the hog, other than hams, shoulders, sides, and lard, that the heads, spare ribs, neck pieces, backbone, etc., were regularly thrown into the Ohio river to get rid of them!" The same writer also says: "The slaughterers formerly received the gut fat for the whole of the labor of dressing, wagoning the hogs more than a mile to the pork houses free of expense to the owners. Every year, however, adds to the value of fat, heart, liver, etc., for food and the hoofs, hair, and other parts for manufacturing pur-

¹U. S. Dept. Agr. An. Rpt., 1863, pp. 207-209.

poses. Six years since, from 10 to 25 cents per hog was paid as a bonus for the privilege of killing. This was later raised to 75 cents and even to \$1.00."

In 1863, hog-packing products consisted of bristles, lard, mess pork, hams, shoulders, bacon, and lard oil used for making candles. The beginning of the immense packing-house by-products industry of modern times was described by an early writer as follows:¹ "Since the Chicago river has ceased to be the sewer for all the offal from the slaughter and packing houses, the owners have been obliged to cart it off to the commons and open fields beyond the city limits at a very heavy expense to them. An enterprising firm has, however, contracted with all the principal firms the present season to carry it all away by the owners paying half the expenses. Instead, however, of carrying it off and throwing it away, they have commenced preparing it for fertilizers. They have provided centrifugal machines, into which they place the refuse from the lard and grease tanks, and throw out all the water, leaving only the solid parts, and that in a pulpy or pulverized condition. In this way they will prepare about 3,000 tons the present season, all of which will be shipped east for the manufacture of commercial manures. Another concern is gathering all the bones it can pick up, from which are manufactured large quantities of animal charcoal, and such as are not suitable for that purpose are ground up and sent east, they having shipped the past season over 300 tons of ground bones alone."

Present leading hog-packing centers.—The rank of the leading hog-packing centers is shown in the following table compiled from the reports of the U. S. Bureau of Agricultural Economics:

<i>Number of hogs packed at leading points for three years</i>				
Market	1929	1928	1927	
1. Chicago	6,361,707	6,394,409	5,611,484	
2. Omaha	2,276,740	2,169,271	1,932,611	
3. St. Paul	2,054,329	2,030,495	2,175,624	
4. Sioux City	1,524,165	1,629,994	1,628,970	
5. Kansas City	1,454,334	1,706,286	1,385,208	
6. New York	1,233,384	1,202,072	1,115,434	
7. St. Joseph	1,199,514	1,280,543	1,129,056	
8. St. Louis	1,098,312	1,050,388	1,086,299	
9. Indianapolis	1,016,585	1,205,795	1,139,137	
10. Baltimore	938,166	1,023,757	868,682	
11. Wichita	790,613	763,754	567,483	
12. Milwaukee	585,752	491,946	539,747	
13. Cincinnati	527,350	1,040,187	858,406	
14. Newark	477,162	603,057	569,736	
15. Pittsburgh	473,551	519,401	488,210	
Totals	22,011,664	23,111,355	21,096,087	

¹ H. D. Emery: Hogs and Pork Packing in the West, U. S. Dept. Agr. An. Rpt., 1863, p. 215.

A total of 27,426,444 hogs were slaughtered at 65 points in 1929. The 15 points listed above slaughtered 80 per cent of this total.

Chicago packing at present time.—The number of hogs packed at Chicago by the leading hog-packing firms in 1927, 1928, and 1929, and the total number packed at Chicago in each of these years were as follows:¹

Hogs packed by Chicago companies for three years

Company	1929	1928	1927
Morris and Company.....	860,800	869,100	519,300
Swift and Company.....	771,600	608,900	557,700
Armour and Company.....	669,200	515,800	717,000
Wilson and Company.....	539,300	646,400	525,300
Western Packing Company.....	438,700	542,700	460,300
Hammond Company.....	422,200	259,000	244,400
Brennan Packing Company.....	361,500	355,700	328,100
Agar Packing Company.....	282,800	240,400	215,100
Boyd-Lunham and Company.....	114,700	219,900	218,900
Anglo-American Company.....	113,900	166,100	144,700
Independent Packing Company.....	98,700	199,900	196,700
All others ¹	2,527,200	2,433,700	1,831,200
Totals.....	7,200,600	7,057,600	5,958,700

¹ Includes hogs slaughtered by Miller and Hart, Roberts and Oake, city butchers, and those received "direct" by packers outside the Union Stock Yards.

Growth of American pork packing.—The pork-packing year ends March 1, and is divided into two seasons—the summer season of eight months, from March 1 to November 1, and the winter season of four months, from November 1 to March 1. This system came into use before the days of artificial refrigeration, and although such a designation is no longer necessary it is still adhered to by statisticians. Before 1873 summer packing was not practiced, but it began in September of that year when it is said to have reached the number of 505,500.²

Edward N. Wentworth of Armour and Company has shown that the ratio between winter and summer packing in the West was 194 to 100 in 1878-'79 and 1879-'80; that about 1890 winter and summer slaughtered were equalized; and that since 1890 summer slaughter has increased to a marked degree. In 1920-'21 and 1921-'22 the ratio (winter to summer) was 66 to 100.³

The present status of pork packing in the United States and Canada is shown by the following figures giving the total number of hogs packed for the calendar year.⁴

¹ Drovers Journal Year Book of Figures for 1929.

² U. S. Bur. Anim. Indus. Bul. 47, p. 256.

³ Monthly Letter to Animal Husbandmen, Armour's Livestock Bureau, Chicago, Jan. 1, 1923.

⁴ U. S. Bur. Agr. Econ., Foreign Crops and Markets, Sept. 23, 1929, p. 490; Statistics of Meat Production and Foreign Trade, 1900-1929.

Yearly hog slaughter in the United States and Canada

Year	Number hogs packed in United States	Number hogs packed in Canada
1920	61,890,000	4,834,000
1924	79,631,000	6,625,000
1928	76,593,000	5,880,000

Exports of pork products.—During the five-year period, 1925 to 1929, we exported 4.6 per cent of our total pork production and 32 per cent of our total lard production.¹ Pork and pork products comprised 85 per cent of the total quantity of our exports of meat and meat products in 1920, and 78 per cent in 1928.² The United States was the leading meat-exporting country during the three pre-war years 1911 to 1913, and we also held first rank, and by a large margin, in each of the years from 1915 to 1920 inclusive.³ In 1920 we contributed over 46 per cent of the meat and meat products exported by all countries.⁴ In 1928 we ranked second to Argentina as a meat exporter, and we contributed 21 per cent of the meat and meat products exported by 17 principal meat-exporting countries.⁵ Our natural advantages for hog raising and our vast production of pork in excess of our own needs give us high rank in the meat export trade.

The development of our export trade in pork since 1790 is shown by the following figures:⁶

Exports of hogs; bacon, hams, and shoulders; pork; and lard from the United States

Fiscal year	Live hogs Thousand head	Bacon, hams and shoulders Million pounds	Pork Thousand barrels	Lard Million pounds
1790	5	(¹)	24	(¹)
1800	14	1	55	2
1820	4	1	44	3
1840	5	2	66	7
1860	48	26	205	40
			Million pounds	
1880	83	760	96	375
1900	51	709	168	662
1910	4	299	45	363
1915	8	550	54	476
1919	25	1,905	67	725
1920	55	1,079	79	587
1929	37	255	51	781

¹ 254,000 pounds bacon, hams, and shoulders; 356,000 pounds lard.

¹ U. S. Bur. Agr. Econs. Rpts.

² U. S. Dept. Agr. Yearbook, 1921, p. 683; 1930, pp. 888, 945.

³ U. S. Dept. Agr. Yearbook, 1920, pp. 719, 720; 1921, p. 682.

⁴ U. S. Dept. Agr. Yearbook, 1921, p. 682.

⁵ U. S. Dept. Agr. Yearbook, 1930, p. 888.

⁶ George M. Rommel: The Hog Industry, U. S. Bur. Anim. Indus. Bul. 47, pp. 263-265; figures since 1900 from U. S. Dept. Agr. Yearbooks.

Following are the quantities and values of pork and pork products exported from the United States during the year 1928:¹

Pork exports of the United States for the fiscal year 1928

Pork products	Pounds	Value
Bacon	117,687,000	\$16,681,000
Cumberland sides	5,512,000	896,000
Wiltshire sides	931,000	140,000
Hams and shoulders	124,149,000	23,306,000
Pork, fresh or frozen	11,413,000	1,774,000
Pork, pickled	33,402,000	4,733,000
Pork, canned	8,153,000	3,128,000
Lard	759,722,000	98,701,000
Neutral lard	23,750,000	3,225,000
Lard compound	4,713,000	613,000
Sausage	5,426,000	1,681,000
Totals	1,094,858,000	\$154,878,000

The destination of our principal pork exports and the total purchases of these by the various countries are shown below:²

Destination of principal pork products exported from the United States in 1929

Country	Bacon Million pounds	Hams and shoulders Million pounds	Pickled pork Million pounds	Lard Million pounds	Total	
					Million pounds	Per cent
1. United Kingdom ..	54	101	8	230	393	36.5
2. Germany	6	....	....	196	202	19
3. Cuba	17	7	11	84	119	11
4. Italy	15	....	....	29	44	4
5. Netherlands	1	....	....	37	38	3.5
6. Canada	6	6	9	....	21	2
7. Belgium .....	....	1	....	15	16	1.5
Other countries ..	30	10	12	190	242	22.5
Totals	129	125	40	781	1,075	100.0

The United Kingdom purchased 42 per cent of our bacon exports in 1929, 81 per cent of the hams and shoulders, and 29 per cent of the lard. Germany bought 25 per cent of our lard exports.

Other countries which use considerable quantities of our pork products are British Guiana, Denmark, Ecuador, Haiti, Newfoundland and Labrador, Norway, Finland, Peru, and Switzerland. A complete list includes others as well. Some countries buy only casings for sausage making, but many countries pay tribute to the American hog in one form or another.

¹ U. S. Dept. Comm. Yearbook, 1928.

² Compiled from U. S. Dept. Agr. Yearbook, 1930, pp. 949-950.

CHAPTER XXVI

MARKET CLASSIFICATION OF HOGS

The hog markets and the newspapers reporting the markets recognize certain rather well-defined market classes of hogs. The classification of a hog or of a carload of hogs depends upon the use to which it is best adapted; and the use to which it is best adapted is determined by its weight, form, quality, condition, and sex. The market classes of hogs and their respective weights are as follows:

Classes	Weights
PRIME HEAVY HOGS.....	300-400 pounds and up
BUTCHER HOGS:	
Heavy butchers.....	250-300 pounds
Medium butchers.....	220-250 pounds
Light butchers.....	190-220 pounds
PACKING HOGS:	
Heavy packing.....	300-500 pounds and up
Medium packing.....	250-300 pounds
Light packing.....	190-250 pounds
Heavy mixed packing.....	300 pounds up
Light mixed packing.....	300 pounds down
LIGHT HOGS:	
Bacon hogs.....	160-200 pounds
Yorkers	150-190 pounds
Light lights.....	130-150 pounds
Light mixed.....	200 pounds down
PIGS	50-130 pounds
FEEDER PIGS.....	50-150 pounds
ROUGHHS	
STAGS	
BOARS	
MISCELLANEOUS:	
Roasting pigs.....	15-30 pounds
Governments	
Cripples	
Dead hogs	

The weight limits of the various classes are flexible and are varied somewhat at different markets depending upon the weights of the hogs received. The weight limits are also varied to some degree on all markets depending upon supply and demand and upon the weights of the hogs marketed in different seasons and in different years. The weights given above are fairly representative of average market conditions.

The grades.—The hogs within a market class may be graded according to their relative value per cwt. The grades are (1) prime, (2) choice, (3) good, (4) medium, and (5) common. Not all of these grades may be found in some of the classes. For example, light hogs and pigs would not grade higher than choice, and packing hogs would not grade higher than good. As will be shown later, there is very little spread in price within each market class of hogs; in fact there is so little spread in price that there is no necessity for grading market hogs. For that reason no mention is made of the grades except in this paragraph. Grades are of very little or no practical importance in the hog market.¹

Prime Heavy Hogs

These are heavy, finished hogs of good quality, usually barrows, which weigh over 300 pounds. In the early days of the pack-



FIG. 141.—Prime heavy hogs.

ing industry a premium was paid for hogs of this class because they were in special demand for the manufacture of clear² and mess pork. Later, when the trade in fresh pork and bacon was developed and when smaller hams and shoulders came into demand, prime heavy hogs no longer commanded a premium. For a number of years past they have sold at lower prices than butcher and light hogs. Very few are received at the markets because they sell at lower prices than younger and lighter-weight hogs, cost more to produce per cwt., and are consequently less profitable to the pro-

¹ For definitions of *class* and *grade*, see page 123.

² Cured sides from which the ribs were removed.

ducer. They yield a heavy loin carcass (described in Chapter XXIV) and such carcasses are frequently made into the same products as packing hog carcasses. Prime heavy hogs sell at about the same price as the best packing hogs of the same weight. Their dressing percentage¹ averages 82 to 84 when dressed shipper style, and 74 to 76 dressed packer style.²

Butcher Hogs

This is one of the most numerous classes of hogs on the markets of the United States and is the class which ordinarily returns the greatest profit to the corn-belt pork producer. Butcher hogs are the best lard-type hogs on the market weighing from 190 to 300 pounds. They must be good in form, quality, and condition,



FIG. 142.—Heavy butcher hogs.

as previously described in Chapter XXII. It is especially important that they be symmetrical and smooth in form, free from paunchiness, free from coarseness, and thick, firm, and smooth in their covering of flesh. They are principally barrows, though a number of good, young, clear (not seedy) sows are included. Sows are less numerous than barrows in this class because good young sows are usually kept on the farm for breeding purposes, and old sows and inferior young sows cannot class as butcher hogs. Butcher

¹ The dressing percentages given in this chapter are those obtained by W. W. Smith of Purdue University from Wilson and Company of Chicago and published in *Pork Production*, pp. 371-374.

² These two styles of dressing are described in Chapter XXIV.

hogs yield light loin carcasses and shipper carcasses. The loins of butcher hogs are of the best size and quality for the fresh meat trade, the hams and shoulders are of the best size, shape, and quality for the trade in smoked meats, the yield of lard is high and of first-class quality, and the bellies of light butcher hogs are usually suitable for bacon. Shipper-dressed butcher hogs usually yield 77 to 82 per cent of carcass to live weight, and when packer dressed 69 to 74 per cent, varying according to form and finish.

Butcher hogs are divided into heavy weights, medium weights, and light weights. These divisions include hogs that are essentially alike except as to age and weight. The older and heavier butcher hogs also average somewhat higher in condition and average about 2 per cent higher in dressing yield than the medium weights, and the latter average about 1 per cent higher than light butcher hogs.



FIG. 143.—Medium-weight butcher hogs.

Packing Hogs

Packing hogs are inferior hogs weighing from 190 pounds up. Most of them are sows which have been used as breeders, but the class also includes coarse, unfinished barrows and the best stags. Sows which show indications of pregnancy sell with a dockage of 40 pounds. Roughts, coarse stags, and boars are not included in the packing class, but sell separately and at lower prices. The best packing hogs yield loins which are used in the fresh meat trade, but the sides (including the loins) of most packing hogs are used for mess pork, barreled pork, and dry-salt meats, and the hams and shoulders are sweet pickled and may be smoked, but are not of the

best quality and are not sold under the best packer brands. The best use of packing hogs requires the manufacture of a larger proportion of salted and pickled products than is true of any other class of hogs. This class is therefore of particular interest to packers who supply the trade in the cheaper kinds of cured meats, and the name "packing hogs" is therefore given to this class. They dress from 77 to 83 per cent shipper style, and 69 to 75 per cent packer style.

Packing hogs are divided according to weight into heavy weights, medium weights, and light weights. In addition to these, many loads of hogs are received at the markets which contain a mixture of various classes of hogs, including a considerable percentage of packing hogs. Such loads are called "mixed packers."



FIG. 144.—Light butcher hogs.

These make up a large share of total receipts of hogs at all of the large market centers. Such loads are usually received from country hog buyers and local shipping associations, and their mixed character is due to the fact that the load is composed of small lots of hogs from a number of farms. Mixed loads may include nearly all classes. There may be some butcher hogs and some good light hogs in the load, but the proportion of old sows, stags, etc., is usually sufficient to give a rather high average weight and a very uneven and mixed appearance. Mixed loads may sell to the packer without sorting, in which case the sorting is done after slaughtering and dressing, but it is principally mixed packing hogs that furnish a field for operation to the speculator. He buys several carloads, sorts them into the various classes, and resells them to various classes of buyers. Loads of mixed hogs averaging above 300 pounds are classed as heavy mixed packing, and those averaging below 300 pounds are classed as light mixed packing. Mixed loads of about the same average weights may differ considerably

in price because of the difference in the number of good hogs included in each load, and for this reason some market reports do not quote prices on mixed loads.

Light Hogs

This class includes all hogs weighing from 130 to 190 pounds, except roughs, stags, and boars, and in addition it includes hogs of bacon type weighing up to 200 pounds. Light hogs constitute a general class which embraces the bacon, yorker, light light, and light mixed classes. Although very similar in weight, these classes differ considerably in form, quality, and condition and the carcasses are adapted to different uses.



FIG. 145.—Packing sow.

Bacon hogs.—The kind of a hog that is an ideal market bacon hog was described in Chapter XXIII. Such a hog is usually of Yorkshire or Tamworth breeding, and very few of these are produced in the United States. With the exception of a few received at the St. Paul market, the stock yards of this country receive practically no hogs of true bacon type. Nevertheless many light hogs of lard-type breeding are received which show a tendency toward the bacon type; they are of stretchy form, fairly long, deep, and smooth in their sides, good in quality, and, as compared to butcher hogs, they carry only moderate finish. They are sorted out of the general run of light hogs, are sold as bacon hogs, and are used for

the production of breakfast-bacon bellies and English meats.¹ Bacon hogs are sometimes referred to in market reports as "singeing hogs," so called because in dressing the hair is sometimes removed by singeing instead of scraping. Bacon hogs dress from 76 to 77 per cent shipper style and 68 to 69 per cent packer style.

Yorkers are the result of a sort of light hog receipts and include all hogs weighing 150 to 190 pounds which are of good quality and reasonably good finish, exclusive of bacon hogs. Yorkers receive their name from the fact that they are commonly shipped to New York and other eastern markets where they are in extensive demand for fresh meat purposes and for the production of "home packed" meats.² If carried to greater weights and higher finish they would class as butcher hogs. They are too fat, too short of body, or are otherwise not adapted for bacon use, and do not have the size, weight, and finish required of butcher hogs. They dress from 75 to 76 per cent shipper style, and 67 to 68 per cent packer style. In recent years the demand for yorkers has increased to a marked degree and the class is now one of considerable importance.

Light lights are of lighter weights than any of the preceding classes, ranging from 130 to 150 pounds. They are called "light lights" because they are the lightest class of light hogs. The St. Paul market and some other markets call them "light yorkers," and do not include light lights in their market classification. They are also sometimes referred to as "heavy pigs." They are used principally for the fresh meat trade. They dress 74 to 75 per cent shipper style, and 66 to 67 per cent packer style.

Light mixed are mixed loads of light hogs ranging from 200 pounds downward. They often include a varying number of pigs. Many such loads sell to packers without sorting, and other loads containing a considerable number of bacon hogs, yorkers, and feeder pigs may be sold to speculators who sort and resell. It should be understood that there are hogs (other than roughs and boars) of yorker and bacon weights which for one reason or another cannot be classed as yorkers or bacon hogs. Such light hogs are coarse, poor in condition, and decidedly on the plain and common order. No special class is provided for them. They comprise a varying proportion of mixed loads of packing and light hogs sold to packer buyers, and their carcasses are classed as packing carcasses, though

¹ English meats are described in Chapter XXIV.

² Ill. Bul. 147, p. 261.

hogs of these weights are not classed as packing hogs on the live-stock markets.¹

Pigs

Pigs, as they are considered on the market, range in weight from 50 to 130 pounds. All pigs within these limits bought for slaughter classify here. They are used principally to supply the demand from the cheaper restaurants and lunch counters, and are in greatest demand in winter, being hard to preserve fresh in summer and too young to cure. They ordinarily dress 68 to 74 per cent shipper style.

Feeder Pigs

Prior to 1914 federal regulations prevented the shipment of hogs from public stock yards for any purpose except immediate slaughter,² but the prevention of hog cholera by the use of the serum treatment has made possible an extensive trade in feeder pigs during recent years. At most market centers there are dealers or traders who buy, vaccinate, and sell feeder pigs. Federal regulations require inspection, vaccination, and either spraying or dipping in disinfectant prior to shipment from the yards.

The principal markets for feeder pigs are St. Paul, Kansas City, and Sioux City. The following table³ gives the shipments from the ten leading feeder pig markets and the total shipments from 65 markets during seven years:

Shipments of feeder pigs (in thousands) from leading markets in seven years

Market	1929	1928	1927	1926	1925	1924	1923
1. St. Paul	167	224	358	375	160	127	151
2. Kansas City	104	105	98	110	67	134	283
3. Sioux City	66	94	115	163	66	...	9
4. Wichita	31	9	7	6	15	27	32
5. Omaha	29	39	26	11	3	8	14
6. St. Louis	25	30	40	19	14	11	41
7. St. Joseph	24	38	29	28	30	13	17
8. Portland, Ore.	20	20	16	20	19	20	18
9. Denver	18	16	21	21	40	54	93
10. Memphis	15	17	14	8	7	5	6
Sixty-five markets ..	623	735	922	917	532	496	820

Chicago, with 396 feeder pigs shipped, ranked 37th as a feeder pig market in 1929.

Feeder pigs weigh from 50 to 150 pounds, with weights from 90 to 120 pounds most desired, and must be in thrifty, growing

¹ As stated in Chapter XXIV, light packing carcasses range downward in weight to 100 pounds.

² Arthur C. Davenport: The American Live Stock Market—How It Functions, p. 81.

³ Compiled from Drovers Journal Year Book of Figures for 1929.

condition, but not fat. They should show quality and evidence of good breeding, and should be as uniform as possible in size and appearance.

Roughs

In this class we find hogs of all sizes that are very coarse, rough, and lacking in condition. They are sometimes called "throw outs." The pork from these hogs is used for the cheaper class of trade for both packing and fresh meat purposes. They are frequently quoted in market reports as "rough packing hogs."

Stags

Stags are hogs that at one time were boars beyond the pig stage and were castrated. They sell with a dockage of 70 pounds. If they are of good quality and condition and do not show too much stagginess, they are included in the various classes of packing hogs. When they are too coarse and staggy in appearance they are sold separately and at lower prices.

Boars

Boars are always sold in a class by themselves and bring a much lower price than the best hogs on the market at the same time. They sell without dockage but at a lower price than stags. The pork is used to supply the cheaper class of trade and also for making sausage. Boars are not usually marketed until their days of breeding service are over and they are old and coarse. Many of them are condemned by government inspectors because of sexual odor. They then bring only fertilizer price. It is usually more profitable to castrate boars, feed them for a time, and send them to market as stags rather than as boars.

Miscellaneous

Roasting pigs are suckling pigs that weigh from 15 to 30 pounds. They come to market in small numbers and only during holiday seasons. They are taken direct from their dams, dressed with head and feet on, and served like spring chickens or turkeys. The price varies greatly.

Governments.—Before hogs are allowed to pass over the scales to be weighed out to the packer, speculator, shipper, or anyone else who may choose to buy them, they must first pass the scrutiny of a government inspector. All hogs not considered healthy in

every respect are tagged by this inspector and retained for further examination. Pregnant sows which appear to be within a few days of farrowing, hogs with bunches, abscesses, etc., also hogs with cuts on the hams and shoulders are retained. These are called "governments." They are usually bought by a local dealer and taken to one of the smaller packing houses where they are slaughtered under the supervision of an inspector. If found to be affected so as to make the flesh unfit for human food, they are condemned and tanked. The tank is a large steam-tight receptacle, like a steam boiler, in which the carcass is converted into grease and fertilizer.

Cripples are hogs that are not able to walk and must be hauled to the packing plant in "cripple carts."¹ Weakness of pasterns, feet, and legs is a common fault in lard hogs, especially in those heavily fattened on corn not properly supplemented with feeds containing the proteins, minerals, and vitamins needed to balance the ration. Lack of exercise is another cause. Overcrowding of cars and loading and unloading too hurriedly often cause crippling. On the market there are far more cripples among hogs than among any other kind of stock. Crippled hogs sell for fully a dollar less per cwt. than they would have otherwise brought.

Dead hogs are hogs that died in transit due to overheat, rough handling, over-feeding in hot weather before shipping, and other causes. They are used in the manufacture of grease, soap, and fertilizer. If they weigh 100 pounds or over, they bring the fertilizer price. If they weigh less, they are held in payment of the cost of handling and the shipper gets no return. Actual count of dead stock removed from cars at Chicago, as made by the U. S. Bureau of Animal Industry for a period of two years, showed the number to be 1 out of 2,500 cattle, 1 out of 164 calves, 1 out of 526 sheep, and 1 out of 244 hogs.²

Summary.—The following chart indicates the relationship of the various market classes of hogs as based on the factors of weight and quality. Beginning at 50 pounds, the minimum weight for pigs, there is a continuous succession of classes to which good hogs are eligible, ranging upward to the heaviest weights. Hogs of these classes may be received and sold in straight carloads, they may be sorted out of mixed loads purchased by traders, or they may be included in the mixed loads sold to local packers. Straight or sorted loads of good hogs are most frequently sold for shipment

¹ There are low-hung carts pulled by one or two horses.

² U. S. Dept., Agr. Rpt. 113, p. 35.

to other points for slaughter or for feeding. Hogs sold to order buyers for shipment to other points for slaughter are referred to in some market reports as "shippers," but this is an indefinite term, as the hogs in demand for shipping may be of several market classes.

<u>Weights</u>	<u>Hogs of good quality</u>	<u>Hogs of inferior quality or mixed</u>	
300	Prime heavy hogs	Heavy packing	Heavy mixed packing
250	Heavy butchers	Medium packing	Light mixed packing
220	Medium butchers	Light packing	
200	Light butchers		
190	Bacon hogs		
160	Yorkers		
150	Light light		
130	Feeder pigs		
50	Pigs		
			Roughs - Stags - Boars

FIG. 146.—Classification of market hogs according to quality and weight.

Inferior hogs include packing hogs, light hogs, roughs, stags, and boars. There is little incentive to make sorts of inferior hogs. What sorting of them is done is usually incidental to the sorting out of good hogs (the inferior ones remaining), or results from throwing out a few inferior hogs present in otherwise good loads. They are not so frequently shipped as are good hogs; they sell largely to local packer buyers.

Hog Prices at Chicago

Chicago prices during 1929.—The following prices are available showing the range in price and average price of hogs of different weights at Chicago in 1929:¹

<u>Class</u>	<u>Range in price</u>	<u>Average price</u>
Packing and butcher hogs, 255-400 lbs.	\$7.25-12.00	\$9.70
Mixed hogs, 195-255 lbs.	7.65-12.50	10.40
Light mixed hogs, 135-195 lbs.	8.25-12.50	10.50
All classes except pigs .....	.....	10.20
Pigs .....	.....	9.15

¹ Drovers Journal Year Book of Figures for 1929.

Chicago and Omaha prices in 1929.—Following is a more detailed list of prices at Chicago and Omaha for the year 1929:¹

Class	Chicago yearly average	Omaha yearly average
Heavy-weight hogs, 250 lbs. up	\$10.29	\$9.83
Medium-weight hogs, 200-250 lbs.	10.52	10.06
Light-weight hogs, 160-200 lbs.	10.49	9.94
Light lights, 130-160 lbs.	10.19	....
Packing sows	9.26	8.94
Feeder pigs, 70-130 lbs. ....	....	8.70
Average cost, slaughter hogs	10.16	9.84

Market values of the various classes.—No detailed records are kept of the average prices made by the various market classes of hogs on the Chicago market. The following table gives the yearly average weights and yearly average prices of hogs marketed at Chicago from 1920 to 1929, and also the averages for the entire ten-year period:²

Average weights and prices for hogs at Chicago for ten years

Year	Average weight Pounds	Packing and butcher hogs 255-400 lbs.	Mixed hogs 195-255 lbs.	Light mixed hogs 135-195 lbs.	All classes except pigs	Pigs
1920	237	\$13.85	\$14.20	\$14.50	\$14.15	\$13.10
1921	236	8.35	8.70	8.95	8.65	8.70
1922	240	9.05	9.30	9.60	9.20	9.15
1923	238	7.45	7.55	7.75	7.55	6.80
1924	235	8.25	8.10	8.20	8.20	6.55
1925	237	11.70	11.75	12.15	11.80	11.20
1926	249	11.95	12.55	13.10	12.40	12.30
1927	240	9.90	10.15	10.40	10.05	8.90
1928	236	9.15	9.35	9.60	9.30	7.95
1929	238	9.70	10.40	10.50	10.20	9.15
Ten year average..	239	9.95	10.20	10.50	10.15	9.40

The spread³ in the price of hogs is usually narrowest in December and January. It is usually widest in July, August, September, and October. The following figures are averages of ten years at the Chicago market:⁴

¹ U. S. Dept. Agr. Yearbook, 1930, p. 854.

² Compiled from Drovers Journal Year Books of Figures.

³ The spread is the amount of variation or difference in price. For example, if hog prices in a certain day, week, or month range from \$9 to \$10, the spread is \$1.

⁴ Compiled from Drovers Journal Year Books of Figures.

Average monthly spread in monthly extreme range of prices for mixed packing, medium, and butcher hogs, 195-255 lbs., at Chicago for ten years, 1920-1929.

Month	Monthly spread	Monthly receipts Thousands	Month	Monthly spread	Monthly receipts Thousands
January	\$2.24	1,027	July	\$3.58	631
February	2.36	820	August	4.01	548
March	2.42	704	September	3.89	476
April	2.78	553	October	3.65	599
May	2.46	627	November	2.64	797
June	2.47	688	December	(2.08)	956

These ten-year averages show nearly twice as much spread in August as in December. It may be noted also that in a general way the spread narrows in months of large receipts, and *vice versa*. Beginning in May, the spread in price widens steadily to its greatest width in August, continues wide during September and October, and then narrows from October to December. It widens again, but to a lesser degree, from December to April, and narrows from April to May.

These variations in spread are explained by the fact that good hogs are most numerous on the market in the months when the spring pig crop and fall pig crop are marketed in largest numbers. The spring crop makes its heaviest run in December and January. The fall crop makes its heaviest run in May and June. During these months the price of good hogs is depressed by large supplies. In July, August, September, and October, good young hogs are held in the country for fattening on the year's crop of corn. Good hogs are scarce on the market at that time and the price of good hogs rises so as to produce a wider spread. Furthermore, receipts in these months include a great many inferior hogs, the result of marketing culled brood sows and other inferior stock. Therefore in these months good hogs are scarce and higher in price, and inferior hogs are relatively plentiful and lower in price, and the spread in price of all hogs becomes the widest of the year.

Spread in price of hogs and other live stock compared.—The spread in price in the hog market is very much less than that in the cattle or sheep market. The spread in price within each market class of hogs is also relatively small. These facts are well illustrated in the following Chicago prices reported in two issues of the Chicago Daily Drovers' Journal:

Top price and spread in price of live stock sold for slaughter at Chicago

Market class	Monday Aug. 19, 1929		Monday Dec. 16, 1929	
	Top	Spread	Top	Spread
HOGS:				
Bulk of sales	\$11.60	\$3.00	\$9.45	\$1.85
Light and medium butcher	11.65	.90	9.50	.25
Heavy butcher	11.05	.90	9.50	.30
Light hogs	11.75	.75	9.40	.40
Packing hogs	9.75	1.75	8.40	1.05
Good to choice pigs	11.40	1.15	9.00	.65
Stags	9.75	1.00	8.25	1.00
All hogs	11.75	3.75	9.50	2.25
CATTLE:				
Beef steers	17.00	8.00	16.00	9.50
Butcher heifers	15.00	7.50	14.50	8.00
Butcher cows	12.00	5.00	10.00	4.25
Butcher bulls	11.50	2.25	10.00	2.00
Bologna bulls	9.75	1.50	9.00	1.75
Cutter and canner cows	7.25	1.75	5.65	1.40
Veal calves	17.50	9.50	14.00	8.00
All cattle	17.50	12.00	16.00	11.75
All cattle except cutters, canners, bulls and calves	17.00	10.00	16.00	10.25
SHEEP:				
Lambs	13.75	7.75	13.85	4.85
Yearlings .....	.....	.....	11.10	4.10
Wethers .....	.....	.....	8.75	3.75
Ewes	6.50	4.50	5.75	3.75
All sheep	13.75	11.75	13.85	11.85
All sheep except ewes	13.75	7.75	13.85	8.85

The above prices for cattle and sheep show vastly more spread than those for hogs. The value of market cattle and sheep is determined very largely by their condition and quality, together with their weight, but the value of a market hog is determined very largely by his weight alone. The condition and quality of hogs vary considerably and affect the price, but do not affect the price to a great degree.

There are several reasons for the small spread in price of hogs. 1. Packers have discovered and developed methods of curing cuts from the poorer hogs which enable them to put this meat on the market in attractive and appetizing form. This has increased the

price of the plainer classes of hogs. 2. Hogs do not vary as much in dressing percentage as cattle and sheep. 3. All hogs are strictly meat animals, whereas the cattle market receives a considerable number of dairy animals, and the sheep market receives a large number of Merinos. 4. Age does not make pork as tough as beef and mutton. Juiciness and color are less variable in pork than in other meats.

The December prices given above indicate no necessity for grading the various market classes of hogs. The August prices indicate that some grading at that season may be advantageous. That there is at most only a very brief period in the year when the grading of hogs may be desirable is shown by the following figures showing the spread in price of the *bulk of hogs sold* at Chicago, and in *all butcher hogs*, as compared to the *three top grades of beef steers*:¹

Spread in price of livestock sold for slaughter at Chicago

Monday—	Bulk of hogs sold	All butcher hogs—heavy, medium, and light	Good to prime steers
January 7, 1929	\$1.35	\$0.40	\$3.75
January 21, 1929	.75	.30	3.50
February 4, 1929	1.10	.55	3.25
February 18, 1929	.65	.35	2.00
March 4, 1929	1.05	.30	3.00
March 18, 1929	1.30	.50	2.50
April 1, 1929	1.35	.30	2.00
April 15, 1929	1.10	.35	1.25
April 29, 1929	1.15	.40	1.35
May 13, 1929	1.55	.70	2.15
May 27, 1929	1.50	.65	2.00
June 10, 1929	1.65	.60	1.50
June 24, 1929	1.65	.70	1.65
July 8, 1929	1.85	1.10	1.90
July 22, 1929	1.20	1.20	2.60
August 5, 1929	3.00	1.35	3.10
August 19, 1929	3.00	1.50	3.75
September 3, 1929 (Tuesday)	3.00	1.55	4.50
September 16, 1929	2.00	1.05	4.25
September 30, 1929	2.85	1.65	3.75
October 14, 1929	2.20	.65	4.00
October 28, 1929	1.80	.40	3.50
November 11, 1929	1.45	.40	3.75
November 25, 1929	1.25	.35	3.80
December 9, 1929	1.25	.35	4.50
December 23, 1929	1.40	.45	4.75

Monthly variations in hog prices.—The accompanying table² shows the average price of hogs for each month and each year of the ten-year period, 1920 to 1929, and the average of each month's

¹ Compiled from Chicago Daily Drovers Journal.

² Compiled from Drovers Journal Year Books of Figures.

prices for the entire ten years. The extreme drop in price during 1920 and 1921 was due to the reaction following the World War.

Monthly and yearly average prices for hogs at Chicago for ten years

	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	Ten year ave.
Jan.	(\$9.15)	\$8.30	\$11.95	11.95	(\$10.40)	\$7.10	\$8.35	(\$7.90)	\$9.40	\$15.00	\$9.95
Feb.	10.25	(8.10)	11.80	12.35	11.05	7.10	8.05	9.85	9.35	14.55	10.25
Mar.	11.55	(8.10)	11.40	12.05	13.55	7.35	8.20	10.45	9.90	14.95	10.75
Apr.	11.50	9.25	10.75	12.25	12.60	7.40	8.10	10.85	8.50	14.90	10.55
May	10.95	9.75	9.65	13.45	12.10	7.35	7.55	10.50	8.35	14.30	10.40
June	10.75	10.00	8.80	14.05	12.50	(7.05)	(6.90)	10.40	8.20	14.70	10.35
July	11.30	10.70	9.15	12.65	13.40	7.75	7.00	9.80	9.75	14.85	10.55
Aug.	10.70	11.50	9.10	(11.55)	13.15	9.30	7.60	8.55	9.35	14.75	10.55
Sept.	9.95	11.95	10.50	12.05	12.40	9.50	8.30	8.70	7.60	15.90	10.70
Oct.	9.50	9.80	10.50	12.65	11.25	9.95	7.45	8.85	7.70	14.05	10.20
Nov.	(9.15)	8.85	9.05	11.90	11.25	8.95	(6.90)	8.10	7.05	12.20	9.35
Dec.	9.40	8.65	(8.35)	11.65	10.95	9.35	6.95	8.20	(7.00)	(9.55)	(9.00)
Yearly ave.	10.20	9.30	10.05	12.40	11.80	8.20	7.55	9.20	8.65	14.15	10.20

Highest monthly prices of each year are printed in bold-face type, and lowest monthly prices are enclosed in parenthesis. Both the highs and lows show considerable variation in the time at which

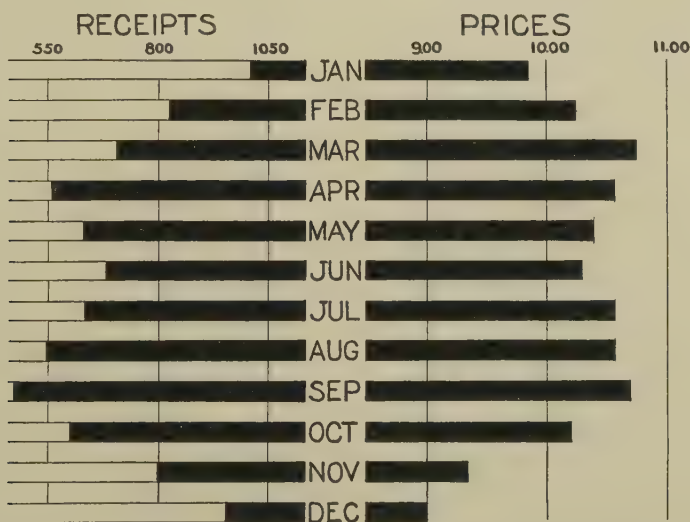


FIG. 147.—Hog receipts and prices at Chicago. This chart shows average monthly receipts of hogs in thousands and monthly average prices of hogs for ten years, 1920 to 1929. Prices are represented by black bars. Receipts are represented by white bars, but each white bar is prolonged in black to make all of equal length, the longer the black coloring the smaller the average monthly receipts. This brings out graphically the correlation between monthly hog receipts and hog prices.

they occur in the different years, but in the monthly averages for the ten-year period the March average at \$10.75 is highest and the December average at \$9.00 is lowest. The September average at

\$10.70 is almost as high as the March average. Between the March and December averages for the ten years the difference is \$1.75.

Hog prices as related to supply.—The relation between monthly supplies and prices of hogs at Chicago for the ten years, 1920 to 1929, is shown in the accompanying chart. The periods of larger receipts in the spring and fall are accompanied by lower prices. Largest receipts in December are accompanied by lowest prices. Although the correlation between receipts and prices is not a perfect one, nevertheless it is plainly evident that the monthly price level is strongly influenced by the volume of monthly receipts.

CHAPTER XXVII

BREEDING FOR THE MARKET

Hog raising has always been a profitable and favorite department of farming in the United States. In Colonial times pork production was a very simple matter. Hogs were allowed to run wild in the woods where they fed upon roots and natural grasses and fattened upon acorns and beech and hickory nuts, called "mast." The only expense to the farmer was the winter feeding of those too young for market and of those reserved for breeding purposes. Inasmuch as Indian corn was the feed used and as this cereal would not repay the expense of transportation to market until the introduction of railways, it cost very little to produce pork. Even after the organization of the national government and the settling of the Middle West it was the general impression among farmers that it cost nothing for a man to make his own pork, and for a long time large numbers of dressed hogs were sold in that section of the country at prices ranging from 75 cents to \$1 per cwt. and were considered sufficiently remunerative at these figures.¹

As greater areas came under cultivation and the natural forests became more restricted, it was found more profitable and convenient to feed hogs on corn than to turn them out into the woods, as they grew faster and took on more fat. It was at this stage in the development of the American swine industry that pork packing was commenced, and this gave a pronounced impetus to hog production. This was before the days of railroads, and hogs were taken overland in droves to the nearest packing point. Later, when the railroads came, a great saving was effected by eliminating losses due to the giving out of hogs on the route, and pork packing and hog raising received an impulse that has greatly helped to make pork one of the most important staples of the country.

Development of lard-type hogs.—The early settlers of the United States brought hogs with them from Europe, and importations of many varieties and breeds of hogs occurred later. Various crosses of these early stocks were made, and from various combinations of bloodlines various American breeds of hogs originated and were later improved by selection. Conditions in this country demand a type of swine that fattens readily and can utilize a large

¹ Charles Cist: *The Hog and Its Products*, U. S. Dept. Agr. An. Rpt., 1866, p. 382.

share of the corn crop in the production of pork and lard, and all of the breeds of hogs developed in the United States are of this type and some of the breeds which we have imported have been remodeled so as to more closely conform to this type.

In early times in the United States there was a large demand for cured meats. In mining camps, lumber camps, and frontier sections, and on sea-going ships, mess pork was in great demand because it could be easily kept in storage for long periods. It could be transported long distances overland in wagons, or overseas in sailing vessels, or on inland waterways in flat boats, without deterioration. In those days only cured meats were in demand in commerce because there were no refrigeration facilities and transportation was slow. Except in winter there were no refrigeration facilities for slaughtering or for storage.

The best mess pork is the fattest pork, because it requires less salt to cure it and it absorbs less salt and is more palatable than lean salt pork. Furthermore, fat meat contains more energy than lean meat and is therefore more economical and valuable, particularly for laborers at hard work in cold weather.

The foreign demand for cheap meats also afforded a large outlet for fat pork made from low-priced corn. This trade was a considerable factor in the early development of our hog and corn industries, and our export trade still affords a market for a considerable percentage of our pork and lard and thereby for a considerable share of our corn crop.

Thus we see that there was need of a particular type of hog adapted to our special requirements, and that there was a vast and increasing field for this new type as the country was settled and as the corn belt was developed. Since an early day there has been every incentive to pay particular attention to pork production and to hog breeding in this country. For many years past the improvement of our American breeds and of our imported breeds, and the maintenance of purebred herds for the purpose of supplying boars and sows for use in farm herds, has commanded the best efforts of a large number of our stockmen.

The number of hogs on farms in the United States on census dates grew from 26 million in 1840, to 34 million in 1860, 48 in 1880, 57 in 1890, and 63 in 1900, and then declined to 58 in 1910 and 59 in 1920. The census date was June 1 until 1910, when it was changed to April 15. It was changed to January 1 in 1920.

The number of hogs on farms in the United States on January 1 of the various years, as estimated by the U. S. Department of

Agriculture, was 34 million in 1880, 52 in 1890, 37 in 1900, 48 in 1910, 72 in 1920, and 53 in 1930. These estimates recently have been revised, using census data as a basis. The revised estimates are 51 million in 1880, 59 in 1890, 54 in 1900, 57 in 1910, 59 in 1920, and 53 in 1930.

The following figures reported by the U. S. Department of Agriculture show the rank of the leading pork-producing countries and the number of hogs in each:

Number of hogs in leading countries

	Country	Year	Number of hogs
1.	China	1913.....	76,819,000
2.	United States	1930.....	52,600,000
3.	Russia	1929.....	21,102,000
4.	Germany	1929.....	20,070,000
5.	Brazil	1920.....	16,169,000
6.	Philippines	1928.....	10,568,000
7.	Poland	1927.....	6,333,000
8.	France	1929.....	6,017,000
9.	Spain	1927.....	5,032,000
10.	Canada	1929.....	4,382,000
11.	Great Britain	1929.....	3,661,000
12.	Denmark	1929.....	3,616,000
13.	Mexico	1926.....	2,903,000
14.	Italy	1926.....	2,850,000
15.	Rumania	1929.....	2,832,000
	World total	.....	260,000,000 ¹

¹ U. S. Department Agr. Yearbook, 1930, p. 848.

Pork production and consumption in the United States is reported in the following table giving the annual slaughter, imports, exports, and consumption of pork and lard:

Estimated annual production and consumption of dressed pork and lard in the United States

Calendar year	Total slaughter		Exports less imports		Consumption			
					Total ¹		Per capita	
	Pork	Lard	Pork	Lard	Pork	Lard	Pork	Lard
	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Pounds	Pounds
1900.....	5,912	1,617	—847	—615	4,927	1,002	64.7	13.2
1910.....	5,649	1,434	—324	—382	5,267	1,052	57.1	11.4
1920.....	7,455	2,056	—926	—643	6,437	1,416	60.5	13.3
1925.....	8,255	2,223	—541	—719	7,794	1,522	67.6	13.2
1926.....	8,181	2,324	—414	—733	7,690	1,584	65.7	13.5
1927.....	8,533	2,356	—295	—717	8,122	1,634	68.5	13.8
1928.....	9,387	2,594	—323	—801	8,863	1,763	73.9	14.7
1929.....	9,223	2,598	—372	—866	8,836	1,735	72.8	14.3

¹ Includes difference between quantities in storage at beginning and end of year.

From 1925 to 1929 inclusive we exported 10.4 per cent of our total production of dressed pork and lard, and during these years our total production of pork, exclusive of lard, was greater than that of beef, veal, mutton, and lamb combined. Our per capita consumption of dressed pork, exclusive of lard, was greater in 1927, 1928, and 1929 than that of all other meats combined. This is shown by the following table:¹

Annual per capita consumption of dressed meat and lard in the United States

Product	1929	1928	1927
Beef, lbs.....	51.4	51.7	58.4
Veal, lbs.....	6.8	6.8	7.4
Lamb and mutton, lbs.....	5.8	5.6	5.4
Pork (excluding lard), lbs.....	72.8	73.9	68.5
Total meat, lbs.....	136.8	138.0	139.7
Lard, lbs.....	14.3	14.7	13.8
Total meat and lard, lbs.....	151.1	152.7	153.5

The distribution of hogs in the United States is shown by the numbers in the leading states and in the various geographical divisions, as estimated by the U. S. Department of Agriculture:

Leading states in numbers of hogs on farms, January 1, 1929

State	Number	Average value	State	Number	Average value
1. Iowa	10,246,000	\$15.00	6. Indiana	2,904,000	\$12.00
2. Nebraska	4,888,000	15.10	7. South Dakota ..	2,536,000	14.60
3. Illinois	4,671,000	14.00	8. Kansas	2,531,000	12.70
4. Missouri	4,070,000	12.20	9. Ohio	2,146,000	11.50
5. Minnesota ...	3,302,000	16.00	10. Wisconsin ..	1,462,000	14.20

Fifty-seven per cent of the hogs in the United States are produced in the seven corn-belt states, Iowa, Nebraska, Illinois, Missouri, Kansas, Indiana, and Ohio.

Distribution of hogs on farms by geographical divisions on January 1, 1929

Division	Number
North Atlantic Division.....	1,318,000
South Atlantic Division.....	4,074,000
North Central, East of Mississippi River....	11,873,000
North Central, West of Mississippi River....	28,160,000
South Central Division.....	6,827,000
Far Western Division.....	2,704,000

Total, United States.....54,956,000

As hogs are now distributed throughout the geographic divisions, the North Central States, extending from Ohio to the western line of Kansas, have 73 per cent of the national total; the Southern States, from the Atlantic Ocean to the western line of

¹ U. S. Bur. Agr. Econs., Mimeographed Rpt., Statistics of Meat Production, Consumption, and Foreign Trade of the United States, 1920-1929.

Texas, have 20 per cent of the total; and the remaining 7 per cent are in the East and in the Far Western States.

Conditions suitable to pork production.—As stated by Henry and Morrison¹ of the University of Wisconsin, "The horse, ox, and

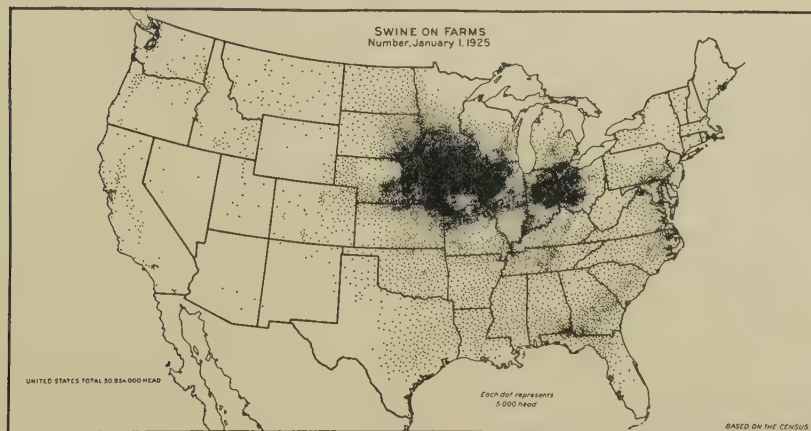


FIG. 148.—Distribution of hogs in the United States. Each dot represents 5,000 head. Compare this map with Fig. 149.

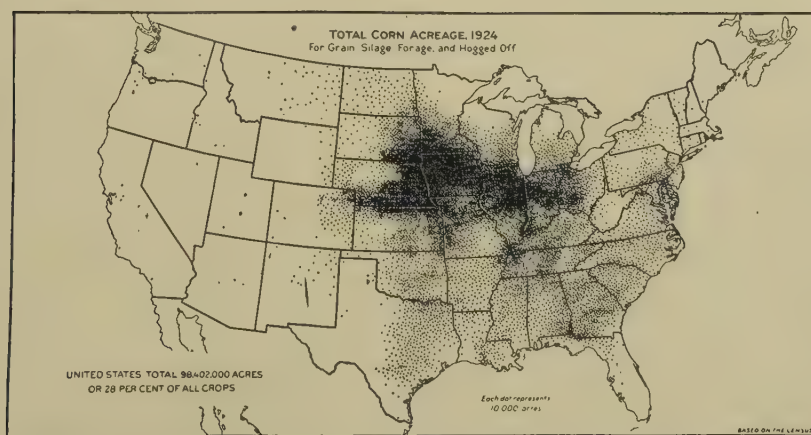


FIG. 149.—Distribution of corn acreage in the United States. One dot represents 10,000 acres.

sheep are normally herbivorous, living on the finer and more delicate portions of plants and their seeds, while the omnivorous pig feeds not only on the tender leaves, stems, roots, and seeds, but on animal matter as well. Because of the limited capacity of the

¹ Feeds and Feeding, 1915, p. 587.

stomach and the nature of its digestive apparatus the pig requires food that is more concentrated and digestible and less woody than that of the other farm animals."

Economical pork production requires the use of a large proportion of grain or other concentrated feeds. Beef and mutton can be produced successfully without grain feeding, but pork production requires grain feeding to a very large degree. Beef cattle and sheep are well adapted to range conditions in the semi-arid regions of the West, but the hog has no place whatever under these conditions. Hogs can profitably utilize limited amounts of legume hay and they can use certain pastures to advantage as supplements to their grain ration, but weanling pigs kept on the best of pastures without any other feed make very slight gains or do not gain at all. The hog is, then, adapted to improved lands and to regions where a plentiful supply of grain for feeding is produced.

Hogs are especially suited to the corn belt because corn is the most economical grain feed available for pork production. Gains produced on corn are usually cheaper than those produced on other cereals, and pork made from corn is firm and of good quality. Hogs are also well adapted to other regions of the United States where barley, kafir, milo, soybeans, cowpeas, field peas, peanuts, skim milk, and buttermilk are available for feeding. Pork is profitably produced in the South from corn, peanuts, grain sorghums, and pasture crops, and it is also produced very economically and profitably in dairy districts where dairy by-products are available for feeding in combination with grain. The farmer in the corn belt or elsewhere who combines dairying and hog raising increases the income from his dairy cattle because dairy by-products are most valuable when used as feed for hogs or poultry, and he increases his profits in pork production because of a larger number of pigs saved and raised per litter and because of rapidity and economy of gains. Many farms in Wisconsin, Minnesota, Illinois, Iowa, and other states have found the dairy cow and the pig to be a most desirable combination for efficiency in the profitable conversion of field crops into animal products. Hogs and beef cattle constitute another excellent combination for the utilization without waste of all grains, roughages, and pastures produced in a general system of farming.

Corn and hogs.—The uses of corn harvested for grain in the United States, based on estimates by the U. S. Department of Agriculture, are as follows:¹

¹ Leighty, Warburton, Stine, and Baker: The Corn Crop, U. S. Dept. Agr. Yearbook, 1921, p. 165.

	Per cent
Fed to hogs on farms.....	40.0
Fed to horses and mules on farms.....	20.0
Fed to cattle.....	15.0
Used as human food.....	10.0
Fed to stock not on farms.....	5.5
Fed to poultry on farms.....	4.0
Fed to sheep on farms.....	1.0
Export and other uses.....	4.5
Total	100.0

Eighty-five per cent of corn is fed to live stock, and hogs consume twice as much corn as any other class of farm animals. Hogs are more closely allied with corn, and less allied with other crops

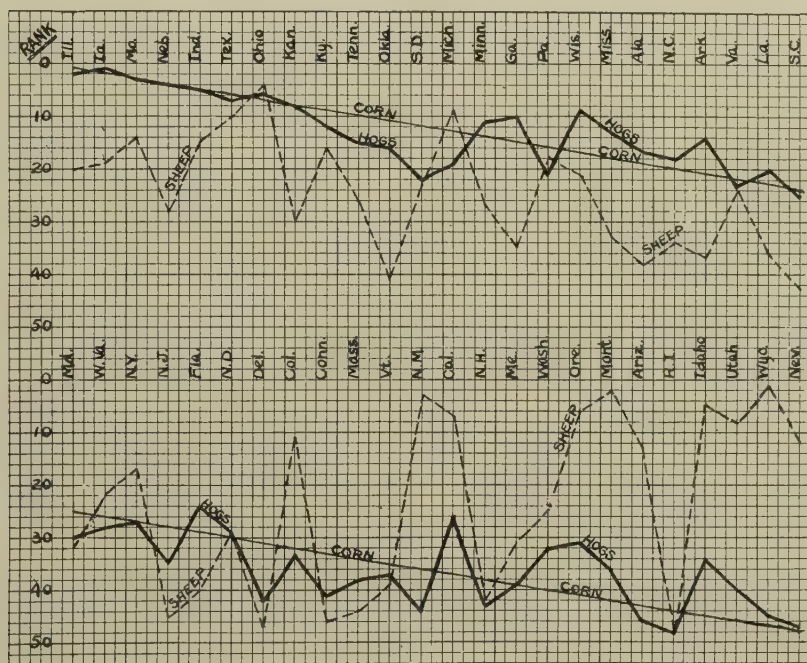


FIG. 150.—Pork production in the United States is closely related to corn production. These graphs show the average rank of the various states in corn production from 1907 to 1915, and in numbers of hogs and sheep on January 1, from 1908 to 1916 inclusive. Hogs are closely related to corn, followed by dairy cattle, horses, beef cattle, and sheep in the order named. Sheep raising has practically no dependence on corn production.

used as feed (including pastures), than is true of other farm live stock. Dairy cattle approach hogs in this regard, followed by horses, beef cattle, and sheep in the order named. The writer determined the average rank of the various states in corn production for the nine-year period from 1907 to 1915 inclusive. Similar aver-

age rankings in each kind of live stock were determined for each state, based on the number of animals in each state on January 1, from 1908 to 1916 inclusive. For example, Kansas' average rank in corn during this period was 8th; in hogs, 8th; in dairy cattle, 11th; in horses, 4th; in beef cattle, 4th; and in sheep, 30th. Thus, Kansas' rank in hogs did not vary from her rank in corn; in dairy cattle she varied 3 points from corn; in horses, 4 points; in beef cattle, 4 points; and in sheep, 22 points. If the number of points between hogs and corn in each state are added together, we find that hogs varied 196 points from corn in the 48 states; dairy cattle varied 233 points from corn; horses, 401 points; beef cattle, 489 points; and sheep, 788 points.

The average rank of the states in corn, hogs, and sheep for the nine years is herewith presented graphically. It will be noticed that in only four states do sheep rank closer to corn than do hogs. These are New Hampshire, Pennsylvania, Michigan, and Wisconsin. In Rhode Island and North Dakota sheep and hogs vary an equal number of points from the rank in corn. In each of the remaining 42 states, hogs rank closer to corn than do sheep. Notice how closely corn and hogs are associated in the first eight states. There seems to be no correlation between sheep and corn. (See Fig. 150.)

Changes in size and weight of market hogs.—By 1850 American swine growers had developed a very large, lengthy, broad backed, deep middled, and rather coarse type of hog that grew to large size and was marketed at very heavy weights. Early pork packers paid a premium for very heavy weights. Weights in market hogs ranging from 350 to 500 pounds were fairly common, and some weighed over 700 pounds.

Writing in 1866, Charles Cist, of Cincinnati, stated:¹ "The different classes of cured pork, packed in barrels, are made of the different sizes and conditions of hogs, the finest and fattest making clear and mess pork, while the residue is put up into prime pork and bacon. The inspection laws require that clear pork shall be put up of the sides with the ribs out. It takes the largest class of hogs to receive this brand."

In 1864 H. D. Emery, of Chicago, stated² that "the price for dressed hogs divides at 200 pounds, the lowest price being for light ones." He also states, "The earliest purchases made for packing in 1832 to 1834 varied from \$2 to \$3 per hundred net. To show the weight of hogs in early days, contracts were sometimes made be-

¹ U. S. Dept. Agr. An. Rpt., 1866, p. 386.

² U. S. Dept. Agr. An. Rpt., 1863, pp. 210, 211.

tween packers and drovers for a lot of hogs, for which a given price was to be paid, the hogs to average 150 pounds; for all that they averaged over that 1 cent per pound was to be added, and all that they fell short 1 cent per pound was to be deducted. This was an incentive to produce heavy hogs, the contracts being made early in the season."

In 1842 a writer¹ described the hogs of the Miami Valley near Cincinnati (foundation stock of the Poland-China breed) as follows: "But the stock to which the people here have paid the greatest attention, and which is their largest and most staple production, is swine. The immense crops of corn enable them to keep vast herds of these animals, and one will find from 50 to 300 head of the various sizes, from pigs up to immense fattening porkers, on nearly every farm that he may happen to pass." The same writer reports that he had repeatedly seen hogs in that region that would weigh from 800 to 1,000 pounds.

Clark Petit's History of Jersey Reds (ancestors of the modern Duroc-Jersey) states² that among New Jersey breeders there "had long existed a great spirit of rivalry as to who should annually win the honor of raising the best lot of hogs, making the greatest average weight at different ages, for which Philadelphia butchers always paid an advanced price." Following are some of the dressed weights reported:

	Average dressed weight Pounds
30 hogs, 22 months old.....	686
18 hogs, 22 months old.....	734
23 hogs, 20 months old.....	639.5
34 hogs, 17 months old.....	565
51 hogs, 17 months old.....	520
17 hogs	862
20 hogs	882
25 pigs, 8 months old.....	413
16 pigs, 7 months old.....	278
20 pigs, 6½ months old.....	280

Other early writers reported equally heavy weights for Jersey Red hogs and early Poland-Chinas.³

The following weights of hogs packed in the West during the winter packing season, and of hogs marketed annually at Chicago, show the changes that have occurred during the last half century:

¹ American Agriculturist, Nov., 1842, p. 234.

² American Duroc-Jersey Record, Vol. 4, pp. 15, 16.

³ U. S. Dept. Agr. An. Rpt., 1866, pp. 384, 385; Standard Poland-China Record, Vol. 1, 1887, pp. 22, 23.

Average live weight of hogs and yield of lard in the West for the winter packing seasons ending March 1¹

Year	Weight Pounds	Per cent Lard	Year	Weight Pounds	Per cent Lard
1873.....	290.53	13.80	1908.....	221.04	14.44
1878.....	282.55	13.66	1913.....	223.50	13.07
1883.....	267.02	13.27	1918.....	220.60	9.41
1888.....	242.30	12.82	1919.....	214.08	13.87
1893.....	227.73	13.90	1920.....	226.57	13.79
1898.....	235.35	14.76	1921.....	229.02	13.65
1903.....	224.05	14.42	1922.....	228.47	15.75

Average live weight of hogs at Chicago²

Year	January average	Yearly average	Year	January average	Yearly average
1876.....	281	250	1905.....	213	222
1880.....	265	246	1910.....	210	235
1885.....	258	239	1915.....	223	219
1890.....	241	234	1920.....	229	235
1895.....	223	230	1925.....	226	234
1900.....	229	233	1929.....	230	239

Note that January weights exceeded yearly average weights at Chicago until 1890, and that subsequently January averages were lower than yearly averages.

Development of an unprofitable type.—During the late seventies and early eighties fresh pork and bacon began rapidly to replace the heavy salt meats which had been in greater demand, and packers gave preference to handy-weight hogs weighing from 225 to 275 pounds. As a result of this, hog breeders turned their attention to the development of quality and early maturity, sacrificing size to obtain them. They developed a very wide, thick, compact, short legged, close-to-the-ground type of hog, having great refinement of bone, head, ear, hair, and fleshing, and great smoothness. An extreme type was developed, in fact the swing from size and coarseness to high quality and compactness was carried so far that during the nineties farmers made strong objections to the small, chunky type developed by many breeders of purebred hogs. The sows were not prolific and the pigs lacked ability to grow rapidly, to make large daily gains, and to attain market weights in quick time.

The modern type.—The reaction from the small type following the year 1905 became so marked that very rough, coarse hogs, and hogs of very inferior form, found favor with breeders and farmers merely because they had large size. A little later, smoothness and good form were added without loss of size. It was found that in order to grow to large size a hog need not be rough and coarse in quality, nor awkward and slouching in form. But there are three

¹ Compiled from Price Current—Grain Reporter Year Books.

² Drovers Journal Year Book of Figures for 1929.

things which are essential to the development of size in hogs and essential to the most rapid growth. These are length of body, length of leg, and large but not coarse bone. The long and rather narrow bodied, leggy, weanling pig with ample bone is the one that grows rapidly, keeps on growing for a long period, and makes a big hog. Such a pig requires also a fourth essential to make him the most profitable sort of a market pig—namely, depth and capacity of chest and middle to insure constitutional vigor, good feeding qualities, and the desired finish at market weights.



FIG. 151.—Excellent type in the herd boar. This Poland-China senior boar pig has size, length and depth of body, smoothness, masculinity, a good top line, a good head, well developed hams, and good feet and legs.

In earlier times when corn was cheap, hogs were given a complete finish before they were marketed. When the change to the handy-weight market hog occurred, corn was still relatively cheap and a high finish was given, producing very broad-backed hogs. In some recent years higher prices for corn and lower prices for lard have operated to lessen to some extent the amount of finish which is most desirable from the producer's standpoint. The modern corn-belt hog, though still a lard hog, is not quite so thick and broad as his predecessor. It seems logical to suppose that the lard hog of the future will be required to make his gains more largely in growth, on cheap forages, and less in fat on heavy grain feeding than was true of the lard hog of the past. But as long as the United

States shall continue to grow a vast yield of corn far in excess of its requirement for human food, it is also reasonable to suppose that corn will continue to be used very extensively in hog feeding, and that our hogs will go to market carrying considerable finish and that they will continue to be valued for the production of both meat and lard, though varying in the percentage yield of lard depending on the supply and price of corn and the price of hogs.

Some questions and answers.—The question is very frequently asked why very large breeding animals are demanded by breeders of purebred hogs inasmuch as the annual crop of farm pigs is sent to market weighing around 225 to 250 pounds. This question may be answered by the following brief statements, many of which summarize facts presented in preceding chapters:

1. In farm herds which produce market hogs there is a tendency toward loss of size, due to feeding corn too exclusively and also due in some cases to lack of proper care and management. Corn is not a good feed to produce bone, muscle, and growth, in fact it is a very poor feed for these purposes. Pigs fed too exclusively on corn, without the addition of feeds rich in protein and minerals, do not grow as large as they would otherwise. They also lack in size and strength of bone. The breeder of purebred hogs is therefore justified in selecting for very large size, length of body, and heavy bone in order that he may supply the farmer with boars and sows that will assist in maintaining good (but not necessarily extreme) size, stretch, and bone in farm herds. As shown in the following paragraphs, good size in farm herds is essential to the production of the most profitable market hogs.

2. The cheapest gains are made during the growing period. This is shown by the following compilation presented by Henry and Morrison ¹ which summarizes over 500 American feeding trials with more than 2,200 hogs:

Weight of hogs	Pounds feed for 100 pounds gain
100-150 pounds.....	437 pounds
150-200 pounds.....	482 pounds
200-250 pounds.....	498 pounds
250-300 pounds.....	511 pounds
300-350 pounds.....	535 pounds

3. It is true of all kinds of farm animals that the larger the breeding stock the longer the growing period of the offspring will be, and the more rapid will be the rate of increase in size during a given period. The pig from large parents makes more growth daily

¹ Feeds and Feeding, 1915, p. 569.

and monthly and continues to grow for more months than does the pig from smaller stock.

4. The growthy type of pig is therefore "younger" at six months of age than the smaller-type pig. This is true because at six months the former has more days of growth ahead of him. As a rule the growthy pig is also younger than the smaller type at the same weight.

5. For these reasons the growthy pig makes his gains at somewhat lower cost because the cheapest gains are made when animals are youngest.

6. If the breeding stock is of large size, the pigs will be growthy, will gain rapidly, and will attain market weights in shortest time.

7. Pigs marketed somewhat in advance of other pigs of the same age usually bring a better price than those marketed later at times of largest receipts.

8. The shorter the feeding period the less the risk and the less the labor cost of producing pork. The man who raises pigs of growthy type has them off to market while his neighbor who raises smaller hogs is still feeding them and still running the risk of loss from disease and other causes.

9. If the market slumps when hogs of the larger type are ready for market, they may be held on feed and will continue to make more efficient use of feed and larger gains than hogs of smaller type. This is sometimes a distinct advantage.

Another question is frequently raised, namely, why should a rather upstanding, rangy type of barrow be preferred when the low-set, compact type is demanded in the steer and wether? The answer is that hogs fatten more readily and to a greater degree than cattle or sheep. It is necessary to foster a blocky type in the latter animals because, as a rule, a good finish at the desired age cannot be attained without it. This is especially true of market lambs and baby beeves. The rather upstanding, rangy pig, of growthy type, if possessed of good feeding qualities and if properly fed, can be given a good finish at any weight above 150 pounds. It is acknowledged that an upstanding form and ranginess in the pig do not alone insure efficiency as a pork producer. He must have other essential points in type as well. Nevertheless, there is no inconsistency in demanding blockiness in beef cattle and sheep, and ranginess and a rather upstanding form in hogs.

Now comes a third question. Is it not true that the packer prefers a hog of great smoothness and great refinement of bone?

Yes, this is true, as shown by the study of the hog carcass. Packers do prefer a high-quality hog. But they offer such a slight premium for this kind of a hog as compared to a rangy pig with medium or large bone that there is no incentive to produce the packer's type. The advantage of large, stretchy breeding stock in prolificacy and of their pigs in economy of gains more than counterbalances the very slight premium paid for market-topping hogs.

The modern barrow of stretchy, growthy type has no difficulty in gaining admission to the butcher hog class where he competes with the packer-type hog, and we have seen in the preceding chapter that in November, December, January, and February when the spring pig crop is marketed, and again in April and May when most fall pigs are marketed, there is very little spread in the price of butcher hogs of all weights. Usually at these seasons the entire spread in price of all butcher hogs of the same weight is only 10 to 25 cents per cwt. The market-topping load with its fancy quality often sells only 5 or 10 cents higher than the bulk of hogs sold that day. The value of the market hog is determined to a much greater degree by his weight alone, with much less regard to both quality and finish than is true of cattle or sheep, *and that is why the most profitable type of lard hog is essentially that type in which the sows are most prolific and in which the pigs make their gains most economically.* Type in hogs is almost entirely a matter of meeting producers' requirements, whereas type in cattle and sheep must give much more consideration to factors which the packer desires and for which he pays a premium large enough to insure their incorporation in the type aimed at by cattle and sheep producers.

Lard-hog type does include, however, many points desired by the packer which are incorporated without in any way lessening economy of production. These are smoothness, freedom from coarseness, symmetry, and good condition. All these points desired by packers may be included and are in fact demanded in the modern type of lard hog without lessening his efficiency in economy of production.

As indicating that the importance of size in hogs is now generally recognized, it may be stated that all of the breeds classed as lard hogs in the United States have been modified in recent years so as to conform more closely to the so-called "big type."

Charles D. Kirkpatrick of Keokuk County, Iowa, states¹ that he raises about 400 hogs for market annually, and he compares his results with big-type hogs in recent years with his earlier experi-

¹ Breeder's Gazette, Dec. 14, 1922, p. 835.

ences with the smaller and finer type then in vogue. He concludes an excellent article as follows:

"The big type has proved fully as important on the sow side of the herd as in the feeding pen. The farrowing troubles of the old-fashioned, thick-built sows caused a deal of disagreeable work, and frequently were the cause of heavy losses. At present there is neither a pair of forceps nor a snare in my hog-house equipment; I haven't helped a sow deliver a pig this season, and I haven't had a veterinarian on the place since a year ago last spring. So far this year the average litter saved to weaning time is nearly seven.

"Length of legs and stretch of body, of course, can be perverted into a gun barrel type of hog. A weasel is not my ideal of conformation for a herd boar. But for my part I have no quarrel with the daylight under the show champions because they can get their posterity over the scales to a speedy and profitable sale of pork."

Selection of breeding stock.—The points which should receive particular attention in selecting hogs for breeding purposes are (1) size, (2) feeding capacity, (3) constitution and vigor, (4) early maturity, (5) strength of back, legs, pasterns, and feet, (6) quality, (7) breeding qualities, (8) uniformity of type, and (9) ancestry.

1. The most profitable hog is one that inherits ability to grow to large size, but which will fatten if desired long before the limit of growth is reached. It is desirable, therefore, to set the standard for matured weight as high as is consistent with proper form, early maturity, and quality. For boars in high condition, the standard may be set at 800 pounds or over without necessarily sacrificing other desirable qualities. Sows in high condition should weigh not less than 600 pounds. By proper selection and by improved methods of feeding and management, these weights may be equalled or surpassed. It is not desirable to keep breeding stock in high condition, but the term "breeding condition" has such a variable meaning that it cannot be used satisfactorily as a basis for weights. In breeding condition, boars and sows may weigh considerably less than 800 pounds and 600 pounds respectively, but they should have enough size of frame and capacity for taking on flesh to enable them to reach these weights if they were fed to high condition.

2. Feeding capacity is indicated by length, depth, width, and fullness of middle. Some degree of paunchiness may be accepted as evidence of feeding capacity. A wide head, prominent poll, well-developed jaw, a mild eye, and a short neck are further indications of a good feeder.

3. Constitution and vigor are indicated by width and depth of chest, a large heart-girth, good spring of rib, large feeding capacity, and a strong appetite. A general appearance of strength and ruggedness without coarseness, an active walk, a bright, open eye, a healthy skin, and abundant, glossy hair are other evidences of constitution, thrift, and vigor.

4. An early maturing hog is one that makes a fast growth, yet can be fattened off at market weight. Such hogs are ready for market in quickest time and at lowest cost. This quality is possessed



FIG. 152.—Good type in the brood sow. Marshall Princess 3d, champion Duroc-Jersey sow at the 1928 National Swine Show. Owned by Shallenberger Farms, Argyle, Ill.

in greatest degree by hogs descended from breeding stock of large size and ample bone that are long bodied, deep of middle, reasonably wide, full made, and well developed in all parts, combining size, stretch, vigor, and good feeding qualities, without coarseness.

5. A low back is a bad fault in a breeding animal. It is a weakness which is as likely to be transmitted to offspring as any other good or bad quality. The boar should stand on large, strong bone, this being one evidence of masculinity, but extremely large, rough bone, covered with a thick, puffy skin is undesirable, indicat-

ing coarseness. The breeding sow should show greater refinement of bone than the boar, yet it should be amply sufficient to sustain not only her weight but also the added weight imposed by pregnancy and large litters. Fine shank bones are not objectionable because they are liable to be fractured by the weight of the sow, but because fine bone is associated with small, weak tendons and ligaments which permit the pastern to drop down and the toes to spread apart, thus making the legs weak and greatly lessening the usefulness of the animal. Proper feed during the growing period and sufficient exercise are other factors which have much to do with the strength of feet and legs. Sickled hind legs, bowed-out hocks, inbent knees, and other deformities should be avoided, particularly in selecting a boar.

6. A reasonable degree of quality, as indicated by smoothness of form and flesh and by trimness of appearance, is something of an evidence of good breeding and must be shown in breeding stock if it is to be shown in their pigs on the market. The butcher desires a very high degree of quality and refinement in head, ear, hide, hair, bone, and fleshing, but does not pay enough premium for it to justify the producer in emphasizing quality too strongly. The breeder should select for as much quality in breeding stock as may be had without sacrifice of proper size, constitution, and size of bone.

The skin over the shoulders of mature boars is thicker and heavier than on sows or barrows. This character, called the "shields," was a highly useful feature in the wild boar as a protection in fighting. The wild boar has transmitted this character in greater or less degree to his domesticated descendants. In some instances the thickening and hardening of the skin is so great as to produce pronounced callouses, and these are objectionable. A smooth shoulder is desired in the boar as well as in the sow and barrow.

7. Great variation in prolificacy exists between individual sows of the same breed. There are also some rather marked differences between breeds. The number of pigs per litter varies from 1 to 16 or more, but with good management is usually from 6 to 10 and under ordinary farm conditions averages about 7 or 8. It is well to remember, however, that it is the number of pigs raised, rather than the number farrowed, which is most important. Sows that are irregular breeders, difficult to get in pig, not prolific, poor sucklers, or that lie on their pigs should be sent to market. Short-middled sows of the chunky type are usually lacking in prolificacy

and milking qualities. Size, stretch, roominess, and a mild disposition are essential to good brood sows. Their udders should include 12 or more well-developed glands and teats.

Masculine, vigorous boars are quick and sure breeders. Motherly or matronly-looking sows are the most satisfactory breeders and best mothers.

8. The breeding herd should be kept as uniform in size, form, color, and other points as possible in order that the pigs may acquire a finish at about the same time and present a uniform and attractive appearance in the feed-lot and on the market.

9. A good ancestry back of a young boar or sow is the best possible guarantee that it will develop into a useful breeding animal. Between two hogs equal in individuality, one the best pig from a poor litter and a poor ancestry, and the other the worst pig from a good litter and a good ancestry, there is almost certain to be a marked advantage in favor of the latter as a breeder. Particularly in selecting boars is it important to buy from a good herd, and to select pigs from a large litter, a good litter, a good sire, and a good dam. In other words an effort should be made to obtain prolific stock of good type and with an inheritance that insures ability to breed on. In breeding for the market, the sows should be purebreds or high grades.¹ None other than a good purebred boar should be used on any herd. In hogs, as in other stock, the sire is at least half the herd.

The 1920 census reported that 3.4 per cent of the hogs in the United States on January 1, 1920, were registered purebreds.²

The sow may be bred when 8 months old, farrowing her first litter when 12 months old. If well fed and cared for, she will raise two litters per year, though many breeders believe that better results are obtained if the sow raises one litter per year, or at most three litters in two years. The average duration of pregnancy in swine is 114 days. Boars 8 to 10 months old may be used on a few sows if they are well developed for their age and well fed. A mature boar will breed one sow a day, or from 30 to 40 sows during the breeding season.

¹ For definitions of *purebred* and *grade* and for discussions of the importance of good ancestry, the utility value of purebred live stock, and the grading process, see Chapter IX.

² Nearly 60 per cent of these were in the corn belt. The ten leading states in numbers of registered purebred hogs, in order of rank, were Iowa, Illinois, Indiana, Missouri, Nebraska, Minnesota, Ohio, South Dakota, Texas, and Kansas.

With no other kind of live stock is there practiced so much mixing of breeds and cross breeding as in the breeding of hogs for the market. It is very commonly believed that by crossing a boar of one breed upon sows of another breed, more vigorous and growthy offspring will result. While there is no serious criticism to be made against such a method so far as the first cross is concerned, it invariably happens that if this policy is followed up and further crossing and mixing is resorted to, a variety of shapes and colors is presented that is most unattractive as compared with a bunch of hogs possessing good uniformity. In the majority of cases it will be most profitable to pick out one of the standard breeds of hogs and stick to that breed year after year. If this is done there need be no lack of vigor in the offspring if the parent stock is selected with due care as to constitution and vigor.

PART IV--HORSES

INTRODUCTION

"From remotest ages he has come with man, side by side, in the glory and achievements of the white race. In all the darings and doings of the Saxon, wherever countries were to be conquered, battles fought, and the banner of Britain carried round the world, wherever has been a footprint, there also was the hoof-beat."—John Trotwood Moore in *The Gift of the Grass*.

For centuries the horse has been a faithful servant of man in the capacity of a burden bearer. As compared with other domesticated animals, the horse is peculiar in his relation to man, for he is valuable on account of his ability to do work and not because he furnishes a tangible product useful as food or otherwise. It is his athletic ability which makes the horse useful.

None other of our domestic animals occupies as important a place in the economy of things as does the horse; if all the horses were suddenly taken from the nations of the world, agriculture, business, and commerce would be seriously impaired and we would soon be in a state of famine. Consider the vast number of horses in use on farms, on city streets, on country roads, in armies, and for numerous pleasure purposes, such as riding, driving, racing in harness and under saddle, hunting, and polo. We could give up any of the other domesticated animals with much less serious results, and this in spite of the advent and improvement of the automobile, motor truck, and tractor, and their wide use at the present time.

The horse may be said to be a locomotive which consumes hay and grain instead of coal. He is self-feeding, self-controlling, and self-reproducing, and is at the same time a very efficient motor. Farmers who use horses may be compared to the engineer who operates a motor. Farmers who breed horses may be compared to the manufacturer of motors. No man can manufacture or operate a motor with real success unless he understands its construction, the importance of its various parts, their strength or weakness, and their relation to one another. No man can learn the construction of a motor by studying its exterior only; he must take it apart and study the various parts, and then put them together again. Then he must put it in motion and study the action of the various levers, pulleys, and springs, in order that he may know the location of weaknesses and at what points the most wear comes. Knowing

these things, he can manufacture a motor of high efficiency, or, operating one, he can obtain from it the greatest amount of work with least danger of injuring the machine. Hence we see how important is a knowledge of the anatomy of the horse as a basis for the study of types of horses and the requirements and capabilities of each type.

It is not possible to develop a good judge of any kind of live stock by teaching simply what to look for in an animal. A mere description of parts or points is not sufficient. The student wants to know why certain things are desirable in an animal, and why certain other things are undesirable. He must know the "why" of each point if he is to value each point properly and put emphasis where it belongs. This is especially true in learning to judge horses. No matter how carefully the points to be looked for in feet and legs are described, the student cannot recognize the importance of these parts and know what constitutes a first-class foot and leg, unless he has a fairly good idea of their anatomy and physiology. In the pages which follow, the writer has, therefore, given considerable attention to some of the essential features of horse anatomy before entering upon a description of the various types and market classes of horses.

Definitions of Horse Terms

Stallion.—Breeding male.

Mare.—The female.

Colt.—A young stallion.

Filly.—A young mare.

Foal.—Colt or filly under one year old.

Weanling.—A weaned foal.

Gelding.—Unsexed male, castrated under two years old. The best age to castrate colts is at one year old after they have been on pasture a few weeks but before fly-time. In the corn belt the best time to castrate is the latter part of May.

Stag.—Unsexed male, castrated when mature or so far advanced toward maturity that masculinity is plainly evident in head and neck. This constitutes coarseness in a horse for harness or saddle use.

Yeld mare.—A mare that has not raised a foal during the season; a dry mare.

Show Yard Classification by Ages

The base date for classifying horses by ages is January 1, and the classes by ages are as follows: The *foal class* includes only

those that were foaled on or after January 1 of the year shown. All foals become *yearlings* on January 1 of the year following the date foaled. One year later they become *two-year-olds*, the next year *three-year-olds*, and the next year they enter the *four years old and over (aged) class*. Some of the larger shows provide separate classes for *four-year-olds*, and when this is done the *aged class* is for animals five years old and over.

Junior champion.—Best animal under three years.

Senior champion.—Best animal three years old or over.

Champion.—Best animal any age.

Grand champion.—Best animal any age or breed. The term “grand champion” is also frequently applied to champions.

CHAPTER XXVIII

BRIEF ANATOMICAL STUDY OF THE HORSE

In all animal life the cell is the structural and functional unit. A tissue is a collection of similarly differentiated cells. A number of tissues grouped together form an organ. The body is an aggregation of organs. The systems of organs are seven in number. They are (1) skeletal, (2) muscular, (3) digestive, (4) respiratory, (5) genito-urinary, (6) nervous, and (7) integumentary.

Skeletal system.—The skeletal system is important as it largely determines the conformation of the horse. The divisions of the skeleton are (1) head, (2) neck, (3) trunk, and (4) legs. The head consists of numerous bones, mostly flat, united by sutures which gradually undergo obliteration with age. The lower jaws are strong and in each jaw there are six molar teeth (24 in all). Twelve of these are temporary—three in each jaw. There are also six incisors in the upper and six in the lower jaws, all of which are temporary and are entirely replaced by the time the animal is 4½ years old.

The vertebral column is a chain of 54 to 56 irregular bones (vertebræ) extending from skull to end of tail. There are seven cervical (neck) vertebræ, 18 dorsal (back), 6 lumbar (loin), 5 sacral (croup), and 18 or 20 caudal (tail) vertebræ. The 3rd, 4th, and 5th dorsal vertebræ have the highest spines which form the withers. (See Fig. 153.)

There are 18 pairs of ribs, 8 of which are true and 10 false. The 8 true pairs join the 8 segments of the sternum or breast bone. The 7th or 8th ribs are longest. There is no collar bone (clavicle) as in man, and the fore legs are not attached to the trunk but are connected by intervening muscles. The hind legs are united to the trunk by the pelvic girdle which is composed of three segments on each side.

Muscular system.—The horse comprises a large number of systems of levers represented in the bones and joints, each supplied with a system of muscles which furnish the power. Muscles exert a force in only one way, and that by shortening, giving a pull. For this reason muscles are arranged in pairs, as illustrated by the biceps and triceps which move the forearm in man. The flexor muscles are always inside the joint and the extensors outside. The

theory has been advanced that the shortening of muscles is due to a change in the form of the muscular cell from an elongated form to one nearly round when stimulated by nerve action. Muscles act through very short distances and upon the short end of levers composing the animal frame. Acting in this way, speed and distance are gained with a corresponding reduction in the magnitude of the force. Because muscles are able to act only through very short distances, it is necessary for them to act upon the short end of the levers in order that sufficiently rapid movement may be gained.

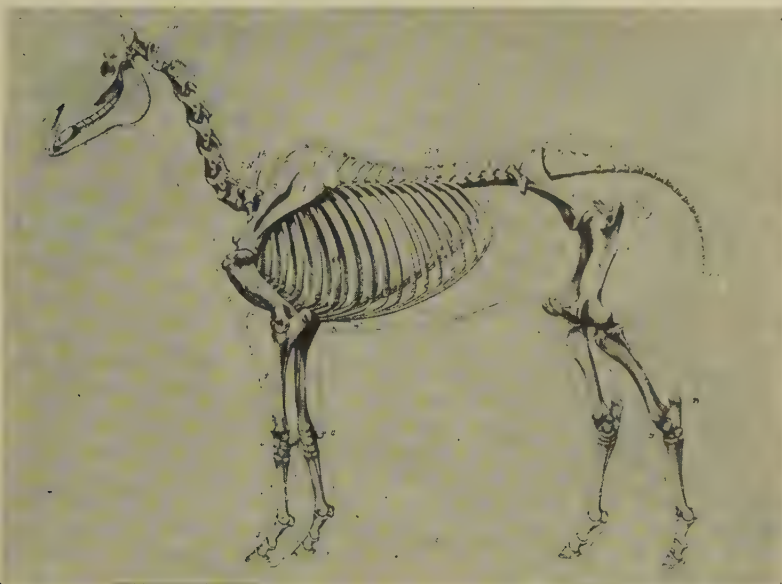


FIG. 153.—Skeleton of the horse. This illustration shows the location of the bones and the degree to which the skeleton and the muscle influence the form.

The muscular system obtains its maximum development in the horse, and upon the excellence of this, beauty of conformation largely depends. Especially is this latter true of the neck and hindquarters. There are no muscles below the knees and hocks—only their tendinous prolongations. The first muscle under the skin almost covers the entire body and is the one that enables the animal to shake flies or any irritating foreign substance off its skin.

Digestive system.—The tongue is small as compared with that of the ox. The capacity of the stomach is small, holding between 3 and 4 gallons, while the stomach of the ox holds 30 to 40 gallons.

But the small size of the organ is compensated for by the large size and capacity of the intestines which hold twice that of the ox. The large intestine has a capacity of about 20 gallons, and the small one 12 gallons. The liver is large, as are also the kidneys.

Respiratory system.—The respiratory organs are well developed, and comprise the nasal cavities, the larynx, the trachea, the bronchial tubes, and lungs. The heart is large and four chambered, and the blood vessels are large and have strong, thick walls. Thus is the horse well fitted for his athletic life.

Nervous system.—The nervous system of the horse is well developed and comprises the brain, spinal cord, and branching nerves. The horse differs from a mere machine in that he is largely capable of guiding his own movements without aid from his driver.



FIG. 154.—Bones of the fore leg. 1, Scapula; 2, humerus; 3, radius and ulna; 4, seven or eight carpal bones; 5, cannon bone and two splint bones; 6, two sesamoid bones; 7, large pastern bone; 8, small pastern bone; 9, navicular bone; 10, coffin bone.

Training accomplishes much in this regard, but the less a horse is possessed of intelligence and nervous control, the less he is automatic as a motor, and the more he becomes dependent upon his driver.

Integumentary system.—The hair or coat is shed in the spring and autumn, except that of the mane and tail which is permanent. There are both sweat glands and sebaceous glands in the skin, but the former are practically absent from the limbs.

Anatomy of the Fore Leg

From the top downward, the bones of the fore leg are as indicated in the accompanying diagram. The fore leg is composed

of a scapula (or shoulder blade) which is articulated to the humerus (or arm) by a ball-and-socket joint, and the arm in turn articulates with the radius by a hinge joint. The lower end of the radius rests upon the upper row of the carpal bones of which there are 7 or 8 in the horse, corresponding to the wrist in man. Below the carpus (knee) is the large metacarpal (or cannon) bone, and articulated with the back of it are two slender rods of bones—the small metacarpal (or splint) bones. The lower end of the large cannon bone forms a hinge with the first phalanx (or large pastern bone), which

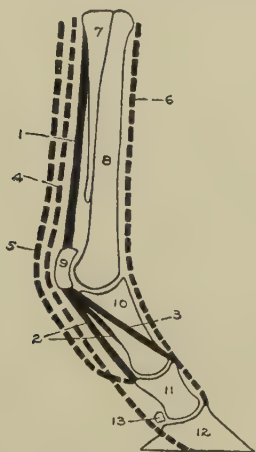


FIG. 155.—Fore leg from knee to ground, showing the bones, ligaments, and tendons. 1, Suspensory ligament; 2, inferior sesamoid ligaments; 3, branch of suspensory ligament; 4, flexor tendon of foot; 5, flexor tendon of pastern; 6, extensor tendon; 7, splint bone; 8, cannon bone; 9, sesamoid bones; 10, large pastern bone; 11, small pastern bone; 12, coffin bone; 13, navicular bone.

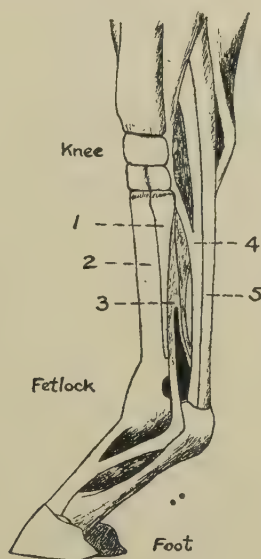


FIG. 156.—Bones, tendons, and ligaments of the fore leg. 1, Splint bone; 2, cannon bone; 3, suspensory ligament; 4, flexor tendon of foot; 5, flexor tendon of pastern.

is followed by the second phalanx (or small pastern bone), and then the third phalanx (or coffin bone), the last named and half of the small pastern bone being enclosed within the hoof. In addition to these, at the articulation between the cannon and the large pastern bone are two small bones, known as the "sesamoids," while at the back of the coffin joint there is a small bow-shaped bone, known as the "navicular," which is frequently the seat of disease.

The bones are held together by ligaments. Tendons are similar in character to ligaments, but differ in that they join muscle to bone.

The scapula, humerus, and radius and ulna are enclosed in heavy muscles which move them. There are no muscles about the knee and the parts below. Instead, long tendons pass down from the muscles above, thus connecting the power with the levers of the lower part of the leg. Some very important ligaments hold the bones below the knee in proper relation to one another. These ligaments are very strong elastic cords. The lower leg moves when the muscles exert a pull on their tendons, which are likewise strong and elastic. The tendons and ligaments of the fore leg are shown in the accompanying drawings. The long ligament from fetlock to knee is the suspensory ligament. It supports the fetlock.

Anatomy of the Hind Leg

The hind leg consists of the femur (or thigh bone) which is the largest in the body and articulates below with the tibia and also with the patella (or knee cap). The hock is composed of six bones

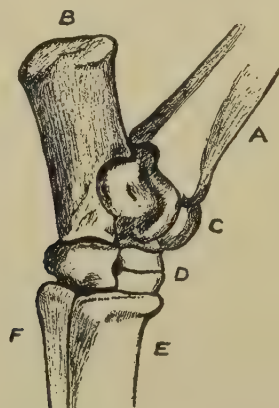


FIG. 157.—Bones of the hock. A, Tibia; B, calcaneus; C, astragalus; D, tarsals; E, cannon bone; F, splint bone.

which may be divided into two sets, each having a purpose of its own. One group of four small bones (tarsals), arranged in two rows and resting on the head of the cannon, are united together and to adjacent bones by short, powerful ligaments, and so close is the union that the movement of one bone upon another is reduced to a simple gliding action of very limited degree. Though slight, this movement is of much importance in breaking the jar communicated to this joint when the horse is in action. Above the small tarsal bones are two larger bones, the astragalus and calcaneus, as shown in Fig. 157.

To the calcaneus is attached the strong tendon known as the

“tendon of Achilles.” By means of it the muscles above exert a powerful pull upon the hock joint, producing extension of the joint. This is the principal means of the horse’s propulsion. The knob-like end of the calcaneus (to which the tendon attaches) forms the point of the hock. In some instances the pull upon the hock has been great enough to produce a fracture of this bone.

Sometimes a diseased condition is brought about by the ossification into one mass of some or all of the bones of the hock. This is called a “bone spavin” and is a serious unsoundness because it destroys the important gliding action of the tarsals, stiffens the joint, and often causes lameness.

The parts below the hock are similar in structure to those below the knee.

The skeletons of man and horse compared show striking similarity, and at some points rather marked variation and difference in proportionment of parts. The horse’s knee corresponds to man’s wrist. The bones below the horse’s knee correspond to those beyond man’s wrist. Following is a comparison of the bones and parts of the fore and hind legs of the horse with the arm and leg of man:

Fore Leg of Horse		Arm of Man	
<i>Parts</i>	<i>Bones</i>	<i>Parts</i>	<i>Bones</i>
Shoulder	Scapula	Shoulder	Scapula and clavicle
Arm	Humerus	Arm	Humerus
Forearm	Radius and ulna	Forearm	Radius and ulna
Knee	7 or 8 carpals	Wrist	7 carpals
Cannon	3 metacarpals	Palm	5 metacarpals
Pastern and foot	1st, 2nd, and 3rd phalanges	Fingers	{ Thumb—2 bones Other fingers—3 bones
Hoof		Finger nails	

Hind Leg of Horse		Leg of Man	
<i>Parts</i>	<i>Bones</i>	<i>Parts</i>	<i>Bones</i>
Croup	Ilium, ischium, and pubis	Pelvis	Ilium, ischium, and pubis
Thigh	Femur	Thigh	Femur
Stifle	Patella	Knee	Patella
Gaskin	Tibia and fibula	Calf	Tibia and fibula
Hock	6 tarsals	Ankle	8 tarsals
Cannon	3 metatarsals	Instep	5 metatarsals
Pastern and foot	1st, 2nd, and 3rd phalanges	Toes	{ Great toe—2 bones Other toes—3 bones
Hoof		Toe nails	

The accompanying drawing makes clear the comparison between the hind leg of the horse and the foot of man. (See Fig. 158 on next page.)

Anatomy of the Foot ¹

The foot is not a mere block of horn, but is a composite structure made up of particular parts, each with a certain work to perform. There is an old saying, very full of truth, "No foot, no horse." A knowledge of the structure of the foot is very essential in learning to judge horses.

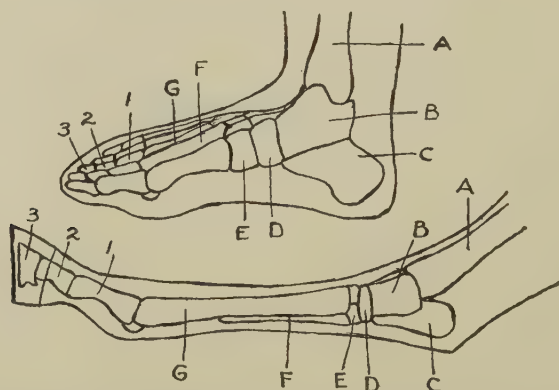


FIG. 158.—Bones of the human foot and hind leg of horse compared. A, Tibia; B, astragalus; C, calcaneus; D and E, small tarsals; F and G, metatarsals; 1, 2, and 3, first, second, and third phalanges.

The exterior of the foot may be divided into five parts, each including one-fifth of the circumference. These are the toe, laterals, and quarters.

The bones of the foot and pastern are four in number, three of which—the long pastern, short pastern, and coffin bone—placed



FIG. 159.—Exterior of the hoof, showing division into toe, laterals, and quarters.

end to end form a continuous straight column passing downward and forward from the fetlock joint to the ground. A small accessory bone, the navicular bone, lies crosswise in the foot behind the coffin joint, enlarging the joint surface. (See Fig. 160.)

¹ The writer is indebted to the revised edition of *Diseases of the Horse*. (U. S. Dept. Agr.) for many of the statements included in the discussion of this subject, particularly to the chapter on Shoeing, by Dr. John W. Adams, University of Pennsylvania.

Tendons and ligaments.—The extensor tendon of the toe passes down the front of the pastern and attaches to the top and front of the coffin bone. The outer branch of the suspensory ligament attaches to the tendon a short distance above this point. The flexor tendon of the foot passes down between the heels, glides over the under surface of the navicular bone, and attaches to the under surface of the coffin bone. The bones of the foot are held together by powerful short ligaments.

The elastic tissues of the foot include the lateral cartilages and the plantar cushion. The lateral cartilages are two plates of gristle, one on either side of the foot, extending from the wings of the coffin bone backward to the heels and upward to a distance of an

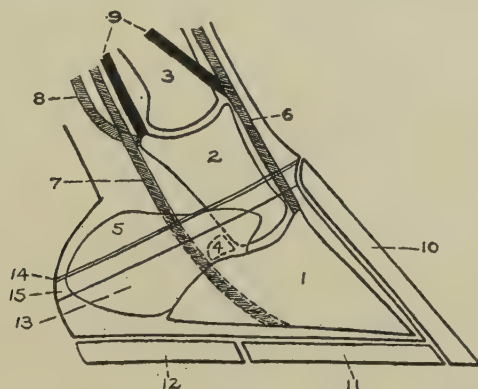


FIG. 160.—Diagram showing structure of foot. 1, Coffin bone; 2 small pastern bone; 3, large pastern bone; 4, navicular bone; 5, lateral cartilage; 6, extensor tendon; 7, flexor tendon of foot; 8, flexor tendon of pastern; 9, branches of suspensory ligament; 10, wall; 11, sole; 12, frog; 13, indicates location of plantar cushion between the lateral cartilages; 14, perioplic ring; 15, coronary cushion.

inch or more above the edge of the hair, where they may be felt by the fingers. When sound, these plates are elastic and yield readily to moderate finger pressure, but from various causes they may undergo ossification, in which condition they are hard and unyielding and are called sidebones. The plantar cushion is a wedge-shaped mass of tough, elastic, fibro-fatty tissue filling all the space between the lateral cartilages, forming the fleshy heels, and serving as a buffer to disperse shocks. It extends forward underneath the navicular bone and flexor tendon, and protects these structures from injurious pressure from below.

The pododerm or hoof-producing membrane is merely a continuation of the derm, or true skin. It covers the foot inside the hoof, just as a sock covers the human foot inside the shoe. It differs

from the ordinary external or "hair" skin in having no sweat or oil glands, but, like it, is richly supplied with blood vessels and sensitive nerves. The functions of the pododerm are to produce the hoof and unite it firmly to the foot.

The hoof and how it grows.—The horny shell, called the hoof, which covers and protects the foot, is made up of three parts, (1) the wall and bars, (2) the sole, and (3) the frog. Each part of the hoof is grown by some particular part or parts of the pododerm. In general it may be said that the horn of the hoof is made up of tubules or shafts of horn which grow from papillæ the same as does hair. These tubules are cemented together by non-tubular matter corresponding to dandruff exfoliated by the skin. In fact, so pronounced is the similarity in growth of horn and hair that coarse

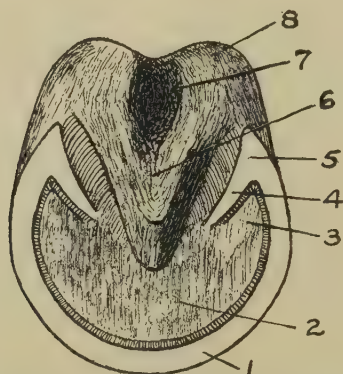


FIG. 161.—The parts of the hoof. 1, Wall; 2, sole; 3, branch of the sole; 4, bar; 5, buttress; 6, frog; 7, cleft of the frog; 8, bulbs of the heels.

hair, especially on the legs and coronet, is associated with horn of coarse texture. Therefore the more coarse and brittle the hair about the coronet, the more porous, brittle, and weak will be the formation of the horny hoof.¹

The wall horn consists of three layers known as (1) the outer or perioplic layer, (2) the middle or coronary layer, and (3) the inner or laminous layer. The perioplic layer is very thin. It is varnish-like in appearance and forms the surface or crust of the wall. Its function is to preserve the moisture of the foot and to absorb moisture. A horse working in sand or dust usually has this outer layer worn away. The coronary layer forms the real basis of the wall. At the heels it is deflected forward to form the bars of the hoof. The angle between the wall and bar is thickened and is

¹J. H. S. Johnstone: *The Horse Book*, p. 24.

called the "buttress." The function of the bars is to react against contraction of the heels. The inner or laminous layer of the wall horn is not tubular. It is termed "laminous" because it has the appearance of the leaves of a book. There are 500 to 600 of these laminæ which extend from the top of the hoof to the sole. It is less thick than the coronary layer, but, like it, is deflected forward at the heels to help form the bars.

Growth of the wall.—At the lower end of the pastern, running along the edge of the hair from one heel around the toe to the other heel, is a narrow ridge of pododerm, $1/16$ to $1/8$ of an inch wide, called the perioplic ring. (See Fig. 160.) It consists of papillæ, which are microscopic nobs or nodules, and from each papilla a shaft of horn grows downward, forming the periople of the wall. Like the periople, the coronary layer grows downward from a band of pododerm at the top of the hoof. This band is called the coronary cushion, and it lies just below and parallel to the perioplic ring. (See Fig. 160.) At the heels it is deflected forward where it produces the horn of the bars. The laminous horn is produced by that part of the pododerm known as the fleshy laminæ; these laminæ extend up and down between the coronary cushion and the sole. The fleshy laminæ of the pododerm and the laminous layer of the wall horn dovetail together, thus holding the hoof securely to the foot.

The sole horn is circular in shape except that it is notched at the rear where it receives the bars and horny frog. It is naturally concave below and is bounded at its edge by the wall and bars. It is very brittle, non-elastic, and easily penetrated. The sole horn is produced by the fleshy sole, which is that portion of the pododerm covering the entire under surface of the foot excepting the fleshy frog and bars.

The horny frog does not come in contact with the sole horn except at its apex. It is tough, elastic, and rather soft horn. The upper part of the horny frog has an elevation or ridge and on the bottom there is a corresponding notch or groove. The horny frog grows from the fleshy frog, which is that part of the pododerm just above the horny frog.

The preceding discussion of the parts of the hoof and pododerm may be summarized as follows:

1. Wall { Perioplic layer, produced by perioplic ring.
Coronary layer, produced by coronary cushion.
Laminous layer, produced by fleshy laminæ.
2. Sole, produced by fleshy sole.
3. Frog, produced by fleshy frog.

All parts of the hoof grow downward and forward with equal rapidity, the rate of growth being largely dependent upon the amount of blood supplied to the pododerm. Abundant and regular exercise, good grooming, moistness and suppleness of the hoof, going barefoot, plenty of good feed, and at proper intervals removing the over-growth of the hoof and regulating the bearing surface—all these, by increasing the volume and improving the quality of blood flowing into the pododerm, favor the rapid growth of horn of good quality. Lack of exercise, dryness of the horn, and excessive length of the hoof hinder growth. The average rate of growth of the hoof is about one-third of an inch a month. Irregular growth often occurs. This is almost always due to an improper distribution of the body weight over the hoof,—that is, an unbalanced foot. An authority on the subject says:¹ “If breeders were more generally cognizant of the power of overgrown and unbalanced hoofs to divert the lower bones of young legs from their proper direction, we might hope to see fewer knock-kneed, splay-footed, pigeon-toed, cow-hocked, interfering, and paddling horses.”

Characteristics of a healthy foot.—A healthy foot is equally warm at all parts, and is not tender under pressure with the hands. The coronet² is soft and elastic at all points and does not project beyond the surface of the wall. The wall is straight from coronet to ground, so that a straight-edge laid against the wall from coronet to ground parallel to the direction of the horn tubules will touch at every point. The wall should be covered with the outer varnish-like layer of horn and should show no cracks or clefts. Every hoof shows “ring formation,” but the rings should not be strongly marked and should always run parallel to the coronet. Strongly marked rings are evidence of a weak hoof, and when limited to a part of the wall are evidence of previous local inflammation. The bulbs of the heels should be full, rounded, and of equal height. The sole should be well hollowed out, the frog well developed, the cleft of the frog broad and shallow, the spaces between the bars and the frog wide and shallow, the bars straight from buttress toward the point of the frog, and the buttresses themselves so far apart as not to press against the frog. The lateral cartilages should yield readily to finger pressure. A hoof of good quality is fine grained and tough, while a poor one is coarse grained and either too mellow and friable or hard and brittle.

¹ Diseases of the Horse, Revised, p. 558.

² The coronet or “hoof head” is the lower end of the pastern immediately above the hoof.

CHAPTER XXIX

SOME IMPORTANT FACTS CONCERNING THE HORSE

Base of support.—The horse's legs are his base of support, just as the table legs support the table. The longer the legs, the less stable the base of support. The smaller the base of support, the less stable it will be. The less stable the base of support, the greater the speed of the horse; while the greater the stability, the greater the power for draft. Any object will be most stable when the center of its weight is directly over the center of its base of support. In horses the center of weight is far forward, lying immediately be-

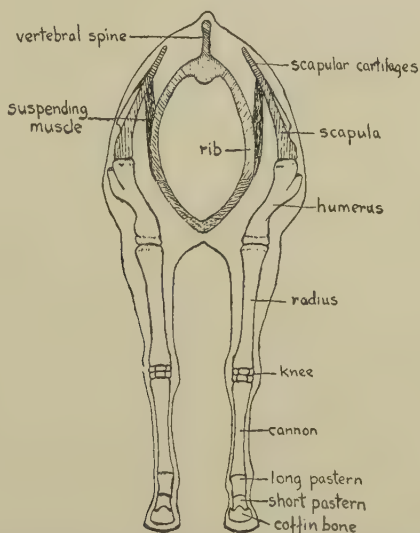


FIG. 162.—Attachment of fore leg to body. Cross-section through chest showing the bones of the fore leg and the muscular attachment of leg to body.

hind the shoulders. Thus the fore legs support much more of the weight of the horse than do the hind legs, in fact it is the function of the forequarters to support, and of the hindquarters to propel. This is the more clearly shown when we examine the anatomy of the horse, for we find that the hind legs are attached to the trunk by the strong ball-and-socket joint, while the fore legs are not directly attached to the trunk but are connected by intervening muscles which form a sort of sling which suspends the body between the two fore legs. The muscle attaching the fore limb to the trunk is the serratus magnus, an enormous triangular muscle which

originates on the upper part of the internal surface of the shoulder blade, spreads out like a fan on the sides of the chest and neck, and ends on the cervical vertebræ and first 8 or 9 ribs. Fig. 162 shows a front view of the muscular attachment of the scapula to the neck and trunk.

When the horse is standing, the base of support is represented by a rectangle the corners of which are the horse's feet. In the walk, the base of support is triangular, for then only three feet touch the ground. In the trot or pace, only two feet touch the ground, and the base of support will be represented by a line. In the run or gallop, the base of support is a point. Thus as speed increases there is a corresponding decrease in stability.

The horse in motion.—We have seen that the horse is rather unstable because the center of weight lies almost over the fore legs. Hence the fore legs answer the purpose simply of a support to the horse's weight when he is in motion. If we could replace the fore legs with a wheel, we would have an equally efficient motor.

When a man walks, he leans forward in order to throw the center of his weight ahead of his base of support. This causes him to begin to fall forward, and indeed he would fall if he did not advance his foot and so bring his base of support once more under, or nearly under, the center of weight. Walking is simply a succession of interrupted falls. The same is true of the horse. In walking he pushes backward against the ground with his hind feet and causes his center of weight to tip forward. The result is that he begins to fall, and if he did not advance a fore foot he would land on his head. By stepping forward he again assumes his equilibrium and immediately tips his weight forward again by propelling with his hind legs. Walking is simply the repetition of this performance over and over again.

In the trot and the gallop or run, there is the same backward thrust with the hind feet and the same recovery with the fore feet, but the thrust is much greater, the stride is longer, and the shock and effort in the recovery are increased in proportion.

In 1897, Tod Sloan, a famous American jockey, went to England to ride. He practiced the same seat which all American jockeys use and with which all Americans are familiar. Its peculiar feature is that the jockey sits as far forward on the horse as possible. When Sloan appeared on English race courses he was severely ridiculed, for at that time English jockeys were not familiar with our methods and it was thought Sloan was trying to attract attention to himself by adopting a ridiculous position on his horse. Race

going people laughed at him until it was noticed that he was enjoying unusual success at winning races. Sloan rode 20 winners during his first season in England, 43 the next, and in 1899 he was first past the post with no fewer than 108 horses. In the same year, two other Americans, the brothers Lester and Johnny Reiff, also had 82 victories to their credit. The methods of these American jockeys were soon copied by most of the English riders, but the Americans continued to pile up a remarkable record of successes, culminating in three successive Derby triumphs—Lester Reiff's in 1901, Martin's in 1902, and Maher's in 1903. During eight years ending in 1905, the eight or nine American jockeys who appeared in England for one or more seasons divided among them, in retain-

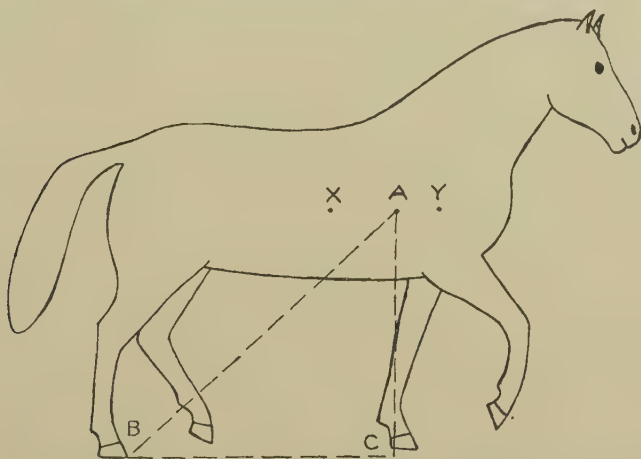


FIG. 163.—The horse in motion. A, Center of weight; AB, line of thrust; ABC, angle of thrust; Y, center of weight when rider is over neck of horse; X, center of weight when rider sits near the tail.

ers, winning fees, and etceteras, fully a million dollars. Their work made a new chapter in English turf history.

No sooner had Sloan shown ability to win consistently than people began trying to find out the secret of his success. They could see that he carried himself as far forward on his horse as possible, and so these questions arose: Does a man seated near the neck of a horse enable the animal to travel faster than one seated near the tail? If so, why? As for the first question, Sloan gave it a practical answer by his consistent winnings. The second question was also finally answered.

A horse to move forward at all must thrust at the earth, and the chief force of this thrust comes from his hind legs. If the cen-

ter of weight of horse and rider is just over, or close to, the thrusting power, naturally it diminishes the efficiency for speed, for instead of thrusting the horse forward, a large portion of the muscular energy is wasted in lifting the weight of the jockey at every stride. The accompanying drawing and the words which follow will make this clear.

The farther forward the center of weight is, the longer is the line from hind foot to center of weight, called the line of thrust, and the more nearly will this line approach the horizontal. As a horse has to raise himself vertically with each bound, it is naturally a matter of very great importance whether he has to lift a dead weight or a weight which throws forward. A jockey on the horse's neck adds to the forward weight, and this moves the center of weight still farther forward and places still more weight on the fore legs and equally less on the hind legs. The longer the angle of thrust, the easier and therefore the faster the horse will go, for his power will then be utilized almost exclusively in a horizontal thrust resulting in speed, and little of his energy will be consumed in simply raising weight to let it fall again. It is the same as a man pushing a wheel barrow; if the load is near the handles it must be raised at each step, while if the load is over or near the wheel the man does not expend so much energy in a lift at each step, but can use all his force at pushing straight ahead.

Where the wear comes.—From what has been said concerning the function of the fore legs in supporting most of the horse's weight, we can readily understand that the horse is more apt to tire, exhaust, and ruin his fore legs than his hind ones. It is common to see men driving their horses at speed when going down hill, thinking that the horse is doing little or nothing because the vehicle follows without having to be pulled. This is a decided error, for in going down hill still more weight is thrown on the fore legs, and if the animal is made to descend at speed he hammers his fore legs severely, and often stumbles and falls. Because of the hammering to which the fore legs and feet of the horse are subjected, and because of the great strain coming upon the hock joint due to its prominent part in propulsion, the feet and legs constitute a most vital part in every type of horse, and special attention should be given to front feet, front pasterns, the hocks, and the set or position of the hind legs when judging.

Phases of the stride.—Dr. Carl W. Gay, of Ohio State University, describes five distinct phases of the horse's stride, as follows: ¹

¹ *Productive Horse Husbandry*, p. 5.

1. A preliminary, during which the leg is undergoing flexion before the foot has left the ground.
2. The breaking over, in which the foot is raised heel first and is rocked up and over at the toe.
3. Flight, during which the foot describes the more or less regular arc of a circle.
4. Contact, as the foot again meets the ground.
5. Recovery, as the weight falls on the foot preparatory to another stride.

Hoof mechanism.—When the foot makes contact with the ground, expansion occurs, especially at the heels. When the foot is raised there is contraction. The plantar cushion, being soft, transmits force or motion in all directions more or less equally (as a liquid). It cannot move downward to any great degree, hence it spreads or diffuses laterally, and so the heels expand. When the horse places his foot on the ground there occurs: (1) Contraction of the hoof at the toe-wall coronet; (2) sinking of the sole, especially at its branches; (3) expansion of the heels; (4) sinking of the bulbs of the heels. These four movements constitute what is known as the “hoof mechanism.” The health of the foot is dependent on the normal and free hoof mechanism, and it should not be hindered by improper shoeing or other causes. Hoof mechanism breaks concussion and assists circulation. Concussion is shock and counter-shock. These shocks must be diffused, and this is cared for laterally in the foot by its changes in form.

Photographs of race horses in action show that at speed the horse sets the heels to the ground before the other parts of the foot. This utilizes the elastic structures of the heels to the utmost, produces a maximum of hoof mechanism, and absorbs the violent shock to the greatest degree possible.

Absorption of concussion.—Every step at the walk or trot results in concussion between the ground and the front foot of the horse. Were it not for certain arrangements for the absorption of this shock or jar, the horse would soon be made worthless. Hoof mechanism is, as we have seen, one of the means of scattering the shock, acting in much the same way as a pneumatic tire on a vehicle. Another safeguard is found in a sloping pastern, which acts in much the same manner as the spring under a carriage. Then there is the angle between humerus and forearm, and also between scapula and humerus, which also act as springs. A sloping shoulder is useful in the same way.

If you have ever ridden in a farm wagon over a rough road, standing on your heels, you can appreciate the tremendous wear which comes on the legs of a horse with poor feet, straight pasterns,

and straight shoulders. Then if you shifted your weight to your toes and bent your knees slightly, you found that your teeth stopped chattering and your hat remained on your head. In other words, your change in position changed the column of bones supporting your weight from a straight, vertical column to a broken one with angles which acted as springs and absorbed the jar. It is



FIG. 164.—Front view of fore legs. A vertical line downward from the point of the shoulder should fall upon the center of the knee, cannon, pastern, and foot. A, Ideal position; B, toes out; C, bow legged; D, narrow chested and toes out; E, stands close; F, knock kneed; G, pigeon toed.

just so with a horse having good feet and nicely sloping shoulders and pasterns.

Defective conformations of the legs and effects on action.—A line around the hoof on the ground gives the area of the base of support of that leg. If the center of the base of support of the leg is not directly under the center of the weight falling on that leg,

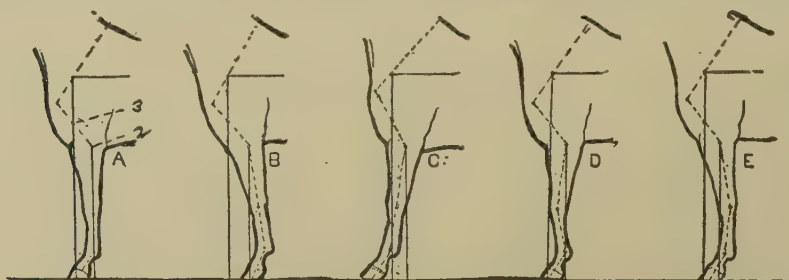


FIG. 165.—Side view of fore legs. A vertical line downward from the center of the elbow joint should fall upon the center of the knee and fetlock joints and meet the ground back of the heel. A, Ideal position; B, camped under; C, camped out; D, knee sprung; E, calf kneed.

the side of the foot nearest the point directly under the center of weight will be compelled to do more than its share of the work. Therefore the leg of the horse should be so set that the center of the base of support comes directly under the center of the weight it bears. The fore legs should be so placed under the body that,

when viewed from in front, a perpendicular line dropped from the point of the shoulder will divide the leg and foot into lateral halves. When viewed from the side, a perpendicular line dropped from the middle of the forearm where it joins the body should divide the leg from body to fetlock into lateral halves and strike the ground just back of the heel.

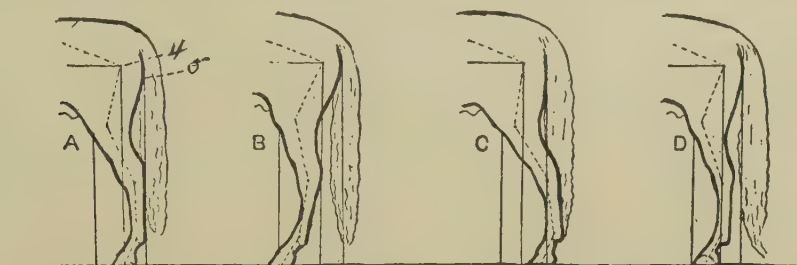


FIG. 166.—Side view of hind legs. A vertical line downward from the point of the buttock should touch the rear edge of the cannon from hock to fetlock and meet the ground some little distance behind the heel. A, Ideal position; B, stands under; C, camped out; D, hind leg too straight.

When the horse assumes his natural position, the hind legs should be so placed that, when viewed from the rear, a perpendicular line dropped from the point of the buttock will divide the leg and foot into lateral halves; and when viewed from the side, this line should touch the rear edge of the cannon from hock point to fetlock and meet the ground some little distance back of the heel.

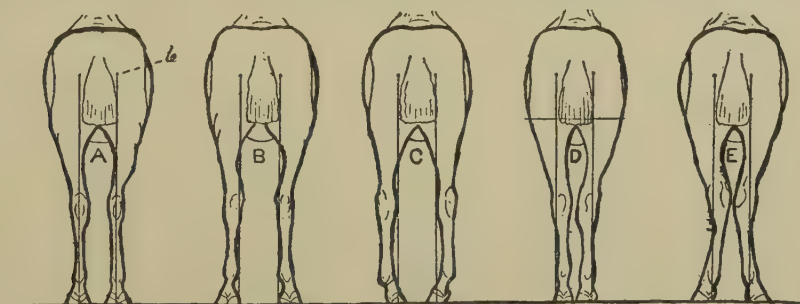


FIG. 167.—Rear view of hind legs. A vertical line downward from the point of the buttock should fall upon the center of the hock, cannon, pastern, and foot. A, Ideal position; B, stands wide; C, bow legged; D, stands close; E, cow hocked.

The direction and slope of the axis of pastern and foot are very important. When the leg is viewed from the front or side, the axis of the pastern and the axis of the foot should be identical. As viewed from the front, the toe should point directly forward. This insures an even distribution of weight to both sides of the foot and

also trueness of action. As viewed from the side, the axis of the front pastern and foot should meet the ground at an angle of about 45 degrees. This angle affords the best combination of strength and springiness.

When moving toward or from you the feet of the horse should appear to have only one motion, which should be vertically up and down. This is very essential in every type of horse. Height of action in any type should be great enough to clear the ground by a reasonable distance, so as to prevent stumbling and insure length of stride. The carriage horse is required to go higher than this for reasons which will be explained in connection with the description of that type. The essentials of good action are (1) straight-line action, (2) long stride, and (3) foot should be picked up with snap.

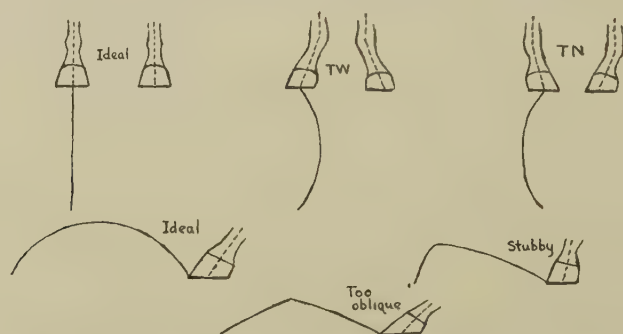


FIG. 168.—Defects in fore legs and their effects on action.

Defects in conformation and placing of feet and legs result in defects in action. Only when the legs are correctly proportioned and properly placed can good action result. Correctness of action depends also upon temperament, strength of muscling, height over withers as compared with height over hips, and general symmetry and proportionment of parts. The most common defects in the shape and position of the legs are shown in the accompanying drawings.

A horse that is "base wide" or "toe wide" in front, swings the leg inward when in action. A "base narrow" or "toe narrow" conformation results in the horse swinging his feet outward, or "padding" as it is called. (See accompanying drawings.) Horses that naturally stand wide at the hocks will travel the same way (wide), which is very undesirable. When the hind legs are bowed outward, the hocks spread still farther outward when the stress comes upon them in action, and usually the foot leaves the ground with a twisting motion which wears out shoes and is otherwise undesirable. Any deviation from trueness in the flight of the foot wastes energy,

detracts from the appearance of the horse in action, and the horse may strike himself, called interfering, which often causes blemishes, lameness, and stumbling.

Viewed from the side, a nicely sloping foot and pastern leave the ground easily and describe the arc of a circle at every step. Straight or stubby pasterns and feet result in a short, stubby way of going that is stilted and non-elastic. A too-sloping pastern and foot are not nicely carried, but are brought out straight to a point in front and then slapped upon the ground. (See Fig 168.) Other defects of action will be discussed in connection with the various types of horses.

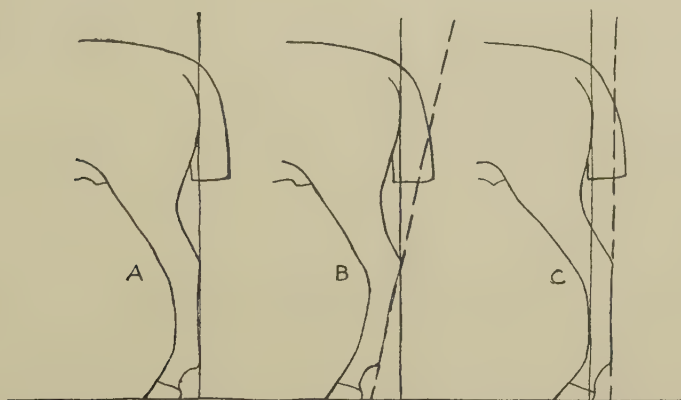


FIG. 169.—Sickle hock. A, Hind leg of a horse of correct conformation; B and C, two positions of the hind leg of a horse with a sickle hock; B, in a position easily exposing the defect; C, in a position in which the defect is not so apparent.

Bent or sickle hocks.—This defect is often difficult for beginners to detect. It is often possible to pose a horse so as to hide this fault unless one knows exactly how to detect it under all conditions. When a horse with a sickle hock stands in a natural position, the defect is easily seen. A vertical line downward from the point of the buttock may then touch the point of the hock, but below that point the cannon slopes forward instead of following the vertical line, and the hind foot is placed too far forward. (See B in Fig. 169, and note that this is not the same defect as B in Fig. 166.) Some horses are very slightly sickled and some are very crooked indeed. Such a conformation is decidedly objectionable because bent hocks are not as stout as straight hocks at a hard pull or at work of any kind, and furthermore the crooked shape of the hock and leg brings an added strain on the hock joint. The sickle hock often develops a curb, and is also subject to other unsoundness.

In showing horses, it is common to stretch them out on their legs to a slight extent, so as to raise the head and neck, level up the croup, and increase the slope of the front pasterns. A horse in such a position is more apt to hold it than a horse standing naturally, and for all these reasons it is practiced by horsemen. It also has the advantage of covering up defects in the set of the legs, particularly a sickle hock. If a horse with sickle hocks is stretched or "camped out" a bit, his hind cannons become vertical, and the novice is likely to overlook the fact that the line of his cannons, even though it is vertical, points back of his buttock, often to a considerable degree. (See C in accompanying drawings, and note that this is not the same as C in Fig. 166.) It is only by noting carefully the direction of the lines indicated in the accompanying drawings that one can detect this fault.

Determination of age from the teeth.—The age of the horse is easily determined up to and including the fifth year by an examination of the incisor teeth, of which there are three pairs in the upper jaw and three pairs in the lower. All of these incisors are temporary or milk teeth up to two years of age. At birth none of the temporary teeth have cut the gums, but at *one year* they have all appeared and the middle and intermediate pairs are in wear, but the corner pairs are not fully in wear. At *two years*, all of the temporary teeth are in wear. At *2½ to 3 years*, the middle pair above and below are shed, and are replaced by permanent incisors. These are broader, heavier teeth, and have a rather rough or corrugated surface, whereas the surface of the milk teeth is smooth. At *3½ to 4 years*, the intermediate pair of permanent incisors appears in each jaw. At *4½ to 5 years*, the corner pair of milk teeth above and below are displaced by permanents, and the horse may be said to have reached maturity.

After five years the age is not so easily determined, nor are the indications so accurate. We rely mostly upon changes in appearance shown by the wearing surfaces of the teeth to tell us the age beyond five years. The wearing surface of new permanent teeth has a long, narrow cup or depression running across it transversely. The rims of these cups disappear through wear, leaving two distinct rings of enamel, one around the margin of the tooth, and the other around the cup. With wear, the cup becomes smaller, more oval or rounding in shape, and more shallow, until it is finally worn almost completely away. Continued wear exposes the tip of the pulp canal or cavity in the center of the tooth, and the exposed tip of this canal appears between what is left of the cup

and the front of the tooth. The exposed pulp cavity is called the "dental star."

At *six years*, the middle pair in the lower jaw are usually worn level and the wearing surface tends to become oval in form. The central ring of enamel is plainly evident, but is smaller than at five years, indicating considerable wear. The lower corner teeth, which at five years showed little or no wear, now usually show wear, the edge surrounding the cup being much less sharp and shell-like. The canine teeth, which first appeared at four years are now completely out. At *seven years*, the lower intermediates are also levelled on the wearing surface and the ring of central enamel becomes wider from before backward, and shorter from side to side. A hook or "swallow tail" is often present on the upper corner teeth because they are broader than the lower corners and do not wear down evenly. At *eight years*, all the lower teeth are levelled and the dental star appears upon the center and intermediate pairs, showing between the front border of the tooth and the front border of the central enamel.

At *nine years*, the hook or swallow tail on the upper corners has often disappeared. The lower centers are round; their central enamel has a triangular form; and their dental star is narrower and more distinct. The center pair of the upper jaw are usually levelled. At *ten years*, the changes previously mentioned become more marked, and the upper intermediates are usually levelled. At *eleven years*, the central enamel of the upper corner teeth becomes elliptical and tends to disappear. The lower teeth now show much wear, the central enamel forms a small ring only, very close to the back border of the tooth, while the dental star becomes narrower and also approaches the back border. At *twelve years*, all of the lower teeth are round, and sometimes the central enamel has disappeared, in which case the wearing surfaces show only a small yellowish spot which is the dental star. At *fifteen years*, the swallow tail, which reappeared at ten years, is still in evidence, the teeth tend strongly toward a triangular shape on the wearing surface, and other indications of age become marked. At *twenty-one years*, the swallow tail is gone again, and all indications of wear are very marked. After ten or eleven years and on up to thirty or more, only general indications serve as a guide to the age. The horseman knows that the teeth change from oval to three-sided with age, and that they project or slant forward more and more each year. In very old horses these features are very marked.

In determining the age, a regular procedure should be followed. First open the lips and determine whether the teeth are temporary or permanent. Unless they are all permanent it is usually unnecessary to open the mouth. If they are all permanent, the wearing surfaces of the lower incisors should be carefully examined first, and then the wearing surfaces of the upper incisors. Also note the profile or slant of the teeth, and the presence or absence of the hook or swallow tail on the upper corner teeth.

Mere description here will not enable the student to become adept at determining age. Actual practice and the study of many mouths are necessary in order to master this subject.

Determination of the height of horses.—The height of a horse is determined by measuring the vertical distance from the highest part of his withers to the ground. The unit in which the height of horses is expressed is the *hand*. A hand is four inches. A horse measuring 60 inches high is thus said to be 15 hands high; a horse measuring 63 inches is said to be “fifteen, three,” meaning 15 hands, 3 inches, written 15-3; and one measuring 65 inches is 16-1 hands high. The dividing line in height between horses and ponies cannot be definitely fixed, but is about 14 hands. Ponies vary in height from 14 hands down to 8 hands or even less, while horses vary from 14 hands up to 18 hands and over. With practice the height of horses may be estimated very closely without the aid of a measuring standard. A person who knows the exact height from the ground to the level of his eyes, and also the exact height from the ground to his chin, can step up to the shoulder of a horse, locate the highest bony part of the withers, and estimate the height very quickly and with a high degree of accuracy.

CHAPTER XXX

ORIGIN OF THE TYPES OF HORSES

Several wild species of horses existed in Europe and Asia from very remote times, but it was in Asia Minor and Egypt that the horse was first domesticated and made to serve man. He was taken thence to Greece, Rome, and Arabia; thence to more remote parts of Europe and Asia, particularly to Spain, France, and England; and thence to America and Australia.

For a long time the horses used by the early European tribes and nations were small, semi-wild animals, and no effort was made to improve them by breeding. They were used principally in warfare, harnessed to chariots. However, there were horses of black color and much greater size and weight native to the region in western Europe now called Flanders, and these were taken south and east, just as the horses of Asia Minor and Egypt were taken north and west. The infusion of the blood of this large Flemish horse increased the size of European horses and made them suitable for riding and other purposes.

The development and progress of the horse was parallel with the development of civilization and a prominent factor in it. The horse was first used for military purposes; next, in ceremonies, both religious and civil; third, in the agricultural and commercial pursuits of nations; fourth, in connection with the pastimes and sports of nations.

First saddle horse.—The Arabian horse was the first breed of live stock developed by man. This horse is a saddle type and was developed for use in warfare. The exact origin is unknown, but it seems to have descended directly from the wild Libyan horse native to northern Africa—most excellent of all known wild varieties of the horse. The Arabian has for centuries possessed such exquisite quality, refinement, intelligence, spirit, docility, and beauty as to make him universally admired and famous. He was taken to England at the close of the seventeenth century and was used in founding the English Thoroughbred and also the Norfolk Trotter which later became the Hackney. In Russia he helped produce the Orloff Trotter, and the Percheron breed of France is also thought to owe some of its excellence to Arab blood in its foundation. Inasmuch as the Yorkshire Coach Horse, Cleveland Bay, American Trotting Horse, American Saddle Horse, and the Morgan

are all sprung largely from the Thoroughbred, every breed of light horses carries the blood of the Arab in greater or less degree.

Turk, Barb and Spanish horses.—The Turk, or Turkish horse, found in portions of European Turkey, but principally in Asia Minor, was of considerable importance in the seventeenth century, but it has deteriorated very much since then. The Barb is a native of the Barbary States, whence its name. It was found in its greatest perfection among the Moors, who introduced the Barb blood into Spain during their rule in that country, and so improved the Spanish horse that for several centuries it occupied the first place throughout Europe. Spanish horses of this stock brought to America by the Spaniards were progenitors of the wild horses once common to Mexico and California.

Origin of the running horse.—One of the first types of horses developed in England was the running horse, the sport of racing having been fostered there from an early date. Long before an Arabian, Barb, or Turk stallion set foot on English soil, a strain of running horses of considerable excellence had been developed, hence the Oriental stallions which were later imported cannot be given more than half the credit for founding the running horse or Thoroughbred. The Thoroughbred owes his origin jointly to the native running mares of England and to the Arabian, Barb, and Turk stallions imported at the close of the seventeenth century.

The Great Horse or War Horse.—The first type of English horse was the "Great Horse" or "War Horse" used during the Crusades and up to about the year 1600 to carry the warriors clad in their suits of heavy armor. A knight in heavy armor, together with the armor for his horse, weighed about 400 pounds, hence the necessity for a big, strong horse. The native English horse was small, and in order to increase the size and strength, Flemish stallions were imported from Normandy, and for nearly 500 years English breeders centered their attention on the matter of size. With the appearance of gunpowder and firearms in warfare, armor was made useless and the heavy war horse gave way to much lighter animals with more speed.

Origin of draft type.—When displaced in warfare, the ponderous war horse did not become extinct, but was put to work at tilling the soil. Prior to this, field labor had been performed solely by oxen, and the ox continued in use as a draft animal even after horses were introduced for farm work. The war horse thus became an agricultural horse and in time was utilized as the foundation of the British draft breeds—the Shire and Clydesdale. The

Percheron breed was built up from the heavy diligence (stage-coach) horses used in France in the early days when roads were deep in mud. The railroad later displaced the diligence horse and he found a place on the farm. When a demand arose from cities for a horse suited to moving heavy freight through the streets, these agricultural horses in England, Scotland, France, and Belgium were bred larger, heavier, and better to meet the new demand, and thus originated the draft breeds as we know them today—Shire, Clydesdale, Percheron, and Belgian. This occurred in the first part of the nineteenth century.

The hunter.—Fox hunting in England dates back to early times, and there has long existed a demand for a type of horse specially adapted to this sport. Strange to say, no breed of hunters has ever been developed, the demand being supplied by Thoroughbreds and grade Thoroughbreds of hunter type.

The carriage horse.—The modern type of carriage horse originated less than 50 years ago. Prior to this, there was a succession of types dating from the time the most primitive carriages came into use centuries ago. The primitive carriage horse was a semi-wild pony, and he was harnessed to a couple of long poles, fixed at one end to the pony's neck, the other end dragging on the ground beneath the load. Next in the evolution of the modern carriage came the sledge, and later came a sledge mounted on rollers. In time the rollers were improved to the present form of an axle and wheels. All this was before the Christian era. Centuries more elapsed before anything deserving the name of carriage was built.

Carriages were first used by the nobility of England about the beginning of the thirteenth century, but the roads were so bad and the vehicles so heavy that they were of little service until the end of the sixteenth century. It was not until more recent times that driving became a real pleasure, for carriage springs were not invented until about 1665 and in their first form appear to have been crude and inefficient. Toward the middle of the eighteenth century, great and rapid improvement was begun in highways, vehicles, and horses, so that the rate of travel was increased from 4 or 5 to 12 miles per hour. Then came the railway, displacing the road coach and consigning the carriage horse to the realm of pastime and pleasure exclusively.

The first English carriage horse was the old black cart horse, or "shire horse" as he was called, heavy, ungainly, with a big head and shaggy fetlocks. He was descended from the old-time war horse, and hence was of Flemish blood. They were so slow that

the footmen could easily go ahead when necessary and engage lodging at the next inn. As highways were improved and carriages made lighter, the cart horse was crossed with the Thoroughbred in order to secure lighter and faster animals for carriage use. Thus originated the Cleveland Bay and Yorkshire Coach Horse, two breeds of heavy carriage horses.

The carriage horse as we know him today is comparatively a new type in both Europe and America. He is a medium-sized animal with outstanding beauty and attractiveness in both form and action. The demand for such a horse did not arise until city streets were improved and carriages made elegant and comfortable, so that driving became a pleasure rather than a painful necessity. From what was called the Norfolk Trotter, which was a fast-trotting, plain, serviceable, moderate-sized horse formerly used by English farmers as a road horse (and used by them under saddle), there was developed in England the Hackney, which is today the foremost breed of carriage horses. The Norfolk Trotter originated at about the same time as the Thoroughbred, being the result of crossing Arabian and other Oriental sires on mares showing aptitude for the trotting gait, just as the Thoroughbred resulted from the crossing of these same sires on native running mares of proven ability on the turf.

The polo pony.—The game of polo was introduced into England in 1874, and to America two years later. This sport calls for an active, rugged pony of about 14-2 hands, and those which best serve the purpose are small-sized or dwarf Thoroughbred horses.

The horse in America.—From an equine standpoint, history repeats itself to a considerable degree in America and also records the creation of at least two new and distinct types of horses. There were no horses on this continent at the time of its discovery, hence American horse history dates from 1492. The first horses were brought to this continent by Cortes and Ferdinand De Soto. Cortes used but few horses in his conquest of Mexico, some of which undoubtedly became the progenitors of the wild horse of the western plains. Similarly, horses abandoned by De Soto near the Texas border no doubt survived and were the principal foundation of the American wild horse.

In colonial times, the most common type of horse was a small saddle horse measuring not more than 14 hands. These were the descendants of the small, unimproved European horses brought over by the first settlers and were of no particular breed or breeding. This little colonial saddle horse was indispensable as a utility

animal, being practically the sole means of transportation in those early times. He was likewise a source of amusement and recreation, being used in running matches of short distances. For this latter purpose, however, the little saddler soon gave way to the English Thoroughbred imported quite extensively by the early settlers of the Carolinas and Virginia.

Field labor was performed by oxen, except in Pennsylvania and New York where Flemish horses had been introduced from Holland. This Flemish horse was, as we have already seen, a large and rather ungainly animal, and when the colonies expanded westward, this horse was used to haul freight over the mountains from eastern ports to Pittsburgh and Wheeling. It required 12,000 wagons annually, each pulled by four or six horses, driven tandem, to carry on the vast freighting business which developed, and the freight bill amounted to \$1,500,000 in a year. The wagons were called Conestoga wagons, and the horses were given the same name.¹ With the coming of the railroad and the river boat, the Conestoga horses and wagons were quickly displaced and no further efforts were made to breed heavy horses in America until about 1870. The blood of the Conestoga was absorbed into the common stock of the country and the type became extinct. Thus we see that Colonial horse stocks were of three types only: (1) the little saddle horse, (2) the Thoroughbred, and (3) the Conestoga.

Origin of the roadster type.—With the opening of roadways, vehicles were quickly brought into use, so quickly indeed that the so-called roads over which they were driven were little more than clearings through the woods with here and there a "corduroy" of logs to make passable some marshy spot. The roads were first improved in the more thickly settled parts of the country, and it was thus about Philadelphia that the roadster type of horse was originated at the beginning of the nineteenth century in response to the demand for a horse suitable for road driving and harness racing. The American Standardbred or roadster was derived from four sources: (1) the English Thoroughbred, (2) the Norfolk Trotter, (3) the Arab and Barb, and (4) certain pacers of mixed breeding. By selecting and breeding for speed at the trotting and pacing gaits, the Standardbred breed has been developed and today may be called a true breed, although the individuals composing it show considerable divergence in type. In Vermont the Morgan horse

¹ The name "Conestoga" is said to be derived from a small river in Lancaster County, Pa., to which the Indians had given that name.—John Strohm: *The Conestoga Horse*, U. S. Dept. Agr. An. Rpt., 1863, p. 175.

was developed. The Morgans descended from one horse, Justin Morgan, whose sire was a Thoroughbred, but whose dam was of unknown breeding. While often regarded as a breed, they really constitute a family of the Standardbred.

American Saddle Horse.—At the time roads were being improved in the East, Kentucky and the West were still a country of bridle paths only. The blue-grass region of Kentucky is splendidly adapted to the production of light horses, and it was principally in that state and Missouri that the American Saddle Horse breed originated and developed. Kentucky was settled in 1775, and as early as 1802 it was said that “almost all of the inhabitants employ themselves in training and ameliorating the breed of horses.” The American Saddle Horse originated from crosses of the Thoroughbred upon pacers of mixed breeding which had been brought from Canada. Considerable Morgan blood entered into the making of the breed also. Starting with these materials, a type of saddle horse possessing great intelligence and beauty was established. These horses are taught five or more distinct gaits, and as a result of years of selection and breeding, there is today a natural inclination on the part of the American Saddle Horse to show these gaits, which include not only the walk, trot, and canter, but also the rack, running walk, fox trot, and slow pace.

The general-purpose horse.—When the railway displaced the Conestoga horse, many farmers attempted to produce what was styled “the horse of all work.” By this was meant a general-purpose horse useful to wagon, plow, or under saddle. The early agricultural papers were full of advice to farmers that such a type be bred, and fair associations encouraged the movement by offering prizes for this class of horses. From 1840 to 1850 the “horse of all work” was the horse of the day. About 1850, the first draft stallions were imported from Europe, but they were not brought over with the idea of producing draft horses in this country, but to breed to the small native mares, with which this country was well supplied, in order to produce a general-purpose horse. Prior to this there were some attempts to produce such a horse by crossing the Thoroughbred and the Conestoga, but the progeny possessed most of the defects of both parents and were utterly unsuited for farm use or anything else. By 1870, breeders had come to realize that there is more profit in producing specialized types of horses useful for special purposes, rather than a single general-purpose type not capable of doing anything well. Thus, although articles still appear occasionally in farm papers advising the production of

a general-purpose horse, and although some county fair associations persist in offering prizes for this ancient type, the general-purpose horse died a natural death a half-century ago. Let him rest in peace.

The draft type in America.—About 1870, there arose a strong demand from cities for a heavy horse, and since that date large numbers of Percheron, Belgian, Shire, and Clydesdale stallions and mares have been imported to America for the purpose of breeding heavy horses fitted for the work of moving heavy loads over city streets—in other words, draft horses. America developed no draft breed of her own. After the Conestoga disappeared we had no heavy horses to use as a foundation for such a breed, and when the demand arose in this country several European countries had draft breeds ready formed which we borrowed from them.

The carriage horse in America.—In America, as in England, the modern carriage horse is a recent addition to our types of horses. The more wealthy families among the early settlers of the Carolinas and Virginia kept coaches for use on state and social occasions, but the so-called roads were so miserable that driving was in no wise a pleasure. Most of the carriages in use in the early days were stage coaches which did the work now done by railways. In 1812, the fare from Philadelphia to Pittsburgh over the national turnpike, 297 miles, was \$20 by coach, and it required six days to cover the distance. Crosses of the Flemish horse of New York and Pennsylvania with the little saddle horse gave the well-knit, sizeable horses required on these early coaches. With the growth of towns and cities, carriages became common, but the horses used would not today be classed as carriage horses although they were of a serviceable kind. Driving for pleasure and pastime, which in later years became so popular with city people, did not begin until after the Civil War, in fact it was not until 1880 that the modern type of carriage horse came into use. From that date forward, there was a large and increasing demand for smoothly-turned, high-stepping, well-mannered horses, weighing from 1,000 to 1,200 pounds. The animals which supplied this demand were for the most part recruited from the ranks of the Standardbred and American Saddle Horse, although our very choicest carriage animals have been English Hackneys. Since 1900 the automobile has displaced a great many carriage horses, especially those of mediocre quality, but there still exists a demand for animals of show-yard quality for which good prices are paid.

Effects of mechanical inventions on horse types.—The inven-

tion of firearms resulted in a change in the type of the cavalry horse from the old-time heavy war horse to a lighter animal with more speed. The displaced type did not become extinct, but was put to use in the fields. The invention of the railway and steamboat and the building of canals restricted the horse's field of usefulness by displacing the stage coaches and the Conestoga horses and wagons. The Conestoga type then became extinct, being mingled and absorbed into the common stock of the country. In France the diligence horse was gradually developed into the Percheron breed. The application of electric power to street railways in 1888 closed a channel of disposal for thousands of cheap horses such as were used on the old-time horse cars, and the perfection of the bicycle and the fad for cycling which followed led many to believe a horseless age was at hand. But the street-car horse was not a profitable animal to produce, and many who took up the bicycle never owned a horse anyway. Horses came into greater demand and brought higher prices than ever before.

Next came the automobile, the motor truck, and the tractor and again a horseless age was predicted. It is a fact that the motor is the strongest mechanical competitor the horse has had to meet, and while it is impossible at this time to say with exactness what the effects will be on horse production, enough time has elapsed to show that the horse yet has an important place in modern civilization. The automobile, motor truck, and tractor are not only doing the work that is also done by horses, but they are doing work which the horse cannot do. In other words, the motor has to a large extent created its own necessity. There is, on the other hand, a vast amount of horse work of various kinds which cannot be done by motors. The horse and the motor each occupy fields of their own, the margins of which overlap to some extent, and here competition between the horse and motor is keen. The carriage horse and roadster have felt this competition most.

Many large business firms have sold their draft horses and installed motor trucks, only to discover that the short haul may be made more economically with horses, and they have therefore reinstated horse equipment along with their motor trucks. Farmers have found that tractor manufacturers are over-enthusiastic regarding the tractor's ability to displace the horse upon the farm. The horse's place in the realm of sport is undisturbed by the automobile. Saddle horses, including the hunter and polo pony, are in good demand, and racing in harness and under saddle continues to prosper throughout the country.

Classification of the breeds.—The breeds of horses may be classified according to type as follows, mention being made of the place of origin and of the number of registered purebred animals of each breed in the United States on January 1, 1920, as reported by the census:

Type	Breed	Place of origin	Number
DRAFT TYPE	Percheron	France	70,613
	Belgian	Belgium	10,838
	Shire	England	5,617
	Clydesdale	Scotland	4,248
	Suffolk	England	(²)
	French Draft ¹	France	2,964
CARRIAGE TYPE	Hackney	England	564
	Cleveland Bay	England	(²)
	Yorkshire Coach	England	(²)
	French Coach	France	(²)
	German Coach	Germany	697
ROADSTER TYPE	Standardbred	United States	4,021
	Morgan	United States	(²)
	Orloff Trotter	Russia	(²)
SADDLE TYPE	American Saddle Horse ..	United States	1,459
	Thoroughbred	England	3,801
	Arabian	Arabia	(²)
PONIES	Shetland	Shetland Islands ..	(²)
	Welsh	Wales	(²)
	Hackney	England	(²)
	All other		15,718
	Total		120,540

¹ In the United States the term "French Draft" includes all animals registered in the National Register of French Draft Horses. All breeds of French draft horses are eligible to registry in this stud book. These are the Percheron, Boulonnais, Nivernais, Ardennais, and Bretonnais. However, the Percheons have their own stud book, the Percheron Stud book of America, and nearly all registered purebred Percherons in this country are recorded in it. Horses registered in the Percheron book are Percherons; those registered in the other stud book are French Draft.

² Not separately reported.

CHAPTER XXXI

DRAFT TYPE

The first question which presents itself is—What is a draft horse? A draft horse is a horse adapted to the work of pulling heavy loads at a walk. The conditions of street traffic in large cities demand the hauling of the largest possible loads. Distances are great and delays waste much time. At street crossings, bridges, and at railway crossings, minutes are lost that in a day count up to hours. At sidings and warehouses, it is a lucky chance if a team can get up to its door or car without waiting for one or more wagons to be loaded or unloaded ahead of it. There is thus a natural tendency for teamsters to haul big loads in order to move the freight, and this makes big horses necessary. Furthermore, big wagons, big loads, and big horses enable merchants to move the goods with less equipment and fewer drivers, and lessen expenditures for shoeing, feed, stabling, harness, and repairs. There is thus a tendency toward big horses and big loads in all cases where quick delivery is not imperative, and where loading and unloading are done at one or a few points. The heavy loading of wagons has gone so far that many cities have placed restrictions upon the size of loads, in order to protect draft animals from abuse. In Chicago, the maximum load for a single horse or mule is 3,500 pounds, and when two or more horses are hitched together, the maximum is 4,000 pounds per animal.

We must bear in mind that the drafter is not only adapted to pulling heavy loads at a slow gait, but that this work is done on hard pavements in the city. The draft horse not only does the hardest kind of work required of horses, but he works under conditions which put his feet and legs to a severe test. The drafter may be said to be the real business horse, whereas the carriage horse, roadster, and saddle horse are largely used for pleasure purposes.

In order to do the work required of him, the draft horse must possess the following qualifications: (1) Weight, (2) strength, (3) true, snappy action, (4) endurance and durability, (5) feeding capacity, and (6) good disposition.

1. **Weight** is decidedly essential. The heavier the horse, the more adhesion he has to the ground. When a horse is working in harness, the traces tend to lift the fore feet off the ground, and

for this reason a heavy horse is able to use his weight to good advantage. In stage-coach days it was a common trick for the driver to throw a bag of meal across a horse's back, or get upon a horse himself, in case the coach got into a place where a hard pull was necessary. By so doing, his team was often able to start the load without other assistance. The added weight produced more adhesion between the feet and the ground, thus enabling the animal to exert all his strength at a pull, instead of uselessly "scratching gravel" when trying to start.

Standing on a hard surface, a man of 200 pounds weight can easily outpull a man of 150 pounds in a tug-of-war. If the 150-pound man take another man upon his shoulders and back, however, he can defeat his opponent who outweighs him by 50 pounds. The man on the shoulders of the 150-pound contestant adds nothing to the muscular power at that end of the rope, but rather lessens it; but the added weight and the increase in adhesion permit the full strength of muscles to be more nearly exerted, and the 200-pound man is readily defeated.

The horse moves a load by (1) simply leaning against the collar, and (2) by muscular strength. Thus weight has a second advantage in that it takes the place of some of the muscular energy, for the weight of a heavy horse more nearly offsets the weight of the load than does the weight of a smaller horse, and every extra pound thrown against the collar means a corresponding reduction in muscular force required in moving the load. Then, too, as a rule, the larger the horse, the stronger he will be.

To sum up, weight in the draft horse has three values: (1) It gives the feet more adhesion with the pavement or ground, so that the muscular power may be applied to the collar, (2) by offsetting some of the weight of the load, it lessens the amount of muscular exertion required, and (3) as a rule, the heavier the horse, the stronger he will be. Some horses make up for a lack of weight by their superior ambition and courage.

2. Strength is a matter of muscling. Draft horses must be very muscular throughout, especially in the hindquarters. When judging drafters, fat should not be mistaken for muscle.

3. Action that is straight and true insures conservation of energy and sure-footedness. The action should also be snappy; this enables the animal to get over the ground rapidly, and shows a willing disposition. Action is also valuable as an index to the way the horse is put together; true action can result only from proper placing of the feet and legs, in fact, from a proper proportionment

of all parts, and their proper relation to one another. Correct action, showing trueness, snap, and length of stride, results from a rather rare combination of proper structure, muscling, and temperament. Therefore good action is not only valuable in itself, but is good evidence of merit in the entire make-up of the horse.

4. **Endurance** means the ability to do the day's work without fagging. **Durability** means the ability to work day after day without breaking down under the strain. Endurance is concerned mostly with wind, muscling, and feeding capacity, while durability depends mostly upon the feet and legs. Some first-hand horses last but six months, or even less, on city streets. Others last as long as fifteen years, and, in some cases, even longer. If a draft horse goes to pieces quickly when put to work, he is a considerable loss to the owner. Feet and legs are the parts most liable to prove defective. Lack of wind is a common fault. The horse with a short rib seldom stands up to hard labor very long. Buyers refuse to invest much money in horses that are shallow bodied and cut up high in the flank, such animals being poor feeders.

5. **Feeding capacity.**—The horse is comparable to a locomotive. He consumes hay and grain for fuel. Other things being equal, the greater the amount of fuel consumed, the greater the work that can be done. The drafter should be a good feeder.

6. **Disposition.**—To be of greatest usefulness a draft horse must be a prompt, willing worker that will be pleasant to handle, active, and quick to respond to commands, yet quiet and docile.

DESCRIPTION OF THE TYPE

General appearance.—The form of the draft horse is broad, deep, massive, compact, rather low set, symmetrical, and stylish. He should have a short back and a long underline. He must weigh not less than 1,600 pounds, and ton horses are the sort to keep in mind as draft horses. Weights over a ton are not uncommon. It has been estimated, on the basis of weights and prices for horses at the large markets, that every 100 pounds above 1,500 adds \$25 to the horse's value. As to height, drafters usually stand from 16 to 17 hands. The height over the hips should be no greater than at the withers, as this detracts from the symmetrical appearance, throws more weight upon the forequarters, and makes the action stilted and heavy. Although the short-legged horse is more powerful, the horse with slightly more length of leg will take a longer stride, and may therefore be more useful. Some buyers also prefer a certain degree of height in the drafter because they

use wagons with a high top or cover, and a short-legged horse would not be in harmony with such vehicles. At this point it may be mentioned that a great many firms desire horses which are not only able to do their work successfully, but which also have considerable style and beauty that will attract attention on the streets and help to advertise the firm and its business. To this end, a great deal of money is invested in vehicles nicely designed and orna-

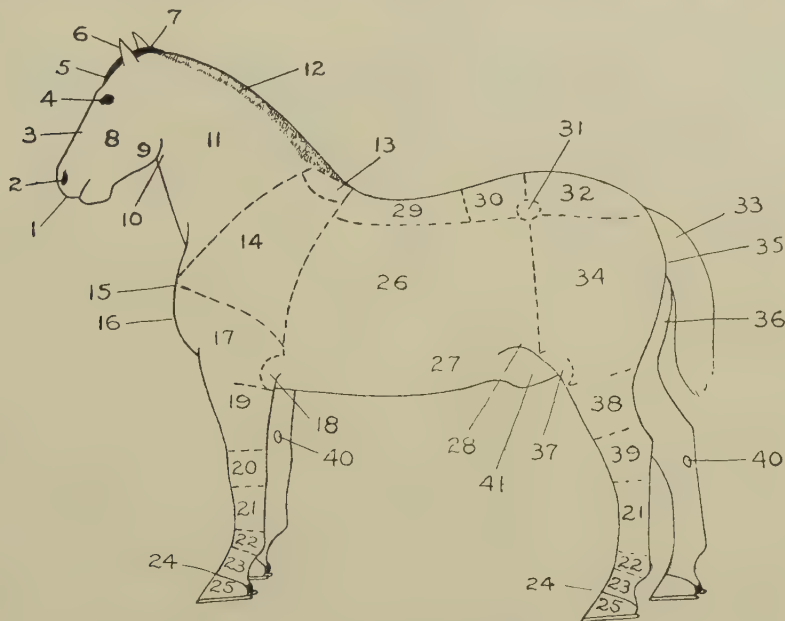


FIG. 170.—Points of the horse.

- | | | | |
|--------------|-----------------------|-------------------|----------------------|
| 1. Muzzle | 12. Crest | 22. Fetlock joint | 32. Croup |
| 2. Nostril | 13. Withers | 23. Pastern | 33. Tail |
| 3. Face | 14. Shoulder | 24. Coronet | 34. Thigh |
| 4. Eye | 15. Point of shoulder | 25. Foot | 35. Point of buttock |
| 5. Forehead | 16. Breast | 26. Ribs | 36. Quarters |
| 6. Ear | 17. Arm | 27. Belly | 37. Stifle |
| 7. Poll | 18. Elbow | 28. Flank | 38. Gaskin |
| 8. Cheek | 19. Forearm | 29. Back | 39. Hock |
| 9. Jaw | 20. Knee | 30. Coupling | 40. Chestnut |
| 10. Throttle | 21. Cannon | 31. Hip | 41. Sheath |
| 11. Neck | | | |

mented, which are horsed with animals that add to, rather than detract from, the appearance of the turnout. Buyers keep the vehicle in mind when buying horses.

Quality and substance, as shown in head, hair, hoofs, bone, and joints, should be preeminent. Substance refers particularly to the size of the bone as shown in cannons and joints, while quality refers to the fineness of texture of all parts. Quality associated with sub-

stance insures good wearing qualities. Quality is shown in bone that is hard and smooth, joints that are well defined or clean, and cannons and pasterns that are entirely free from meatiness. As previously explained, it is objectionable for a horse to be meaty in his knees or hocks or in the parts below them. The term "clean," as applied to the hocks, knees, cannons, ankles, and pasterns, means that these parts are entirely free from meatiness, swelling, or other unnatural development, so that the natural structure is sharply and clearly defined. Clean legs are one of the best and most important evidences of good quality. The cannons of some draft breeds have more or less long hair, called "feather." If it is fine and "pily," rather than coarse and curly, it indicates quality, for fine hair seldom covers rough, coarse bone. The entire coat, including mane and tail, also indicates quality if the hair is soft and fine. The horse with quality will have a head of medium size, a neat ear, a trim muzzle, and a chiseled appearance about the face and jaws. He also has hoofs of fine texture which will wear well, and his joints are less subject to bony diseases.

The size of the **head** should be proportionate to the size of the horse. A pony head is not the right sort for a draft horse, and a barrel head indicates coarseness and lack of good breeding. Every line and feature should be distinct; there should be a chiseled appearance that indicates character, quality, and good breeding. Great width between the eyes and a broad, full forehead show intelligence. The eyes should be large, bright, clear, and very prominent, to insure good vision, for the horse should be able to see where he is stepping. The nose and muzzle should be broad, indicating a good feeder. The nostrils should be large (but not permanently distended), to provide easy breathing. Trim lips that are thin show quality and refinement. Strong cheeks, and jaws that are wide across underneath, provide good grinding ability for proper mastication of feed. The ears should be of fine texture and medium size, and should be set well up toward the poll and carried alert. Ears set down on the side of the head and carried in a lopping fashion decidedly injure the appearance. The expression of the eye and the carriage of the ear are good evidences of the temperament and disposition. The head should be of medium length, and, as viewed in profile, the face line should be rather straight. A Roman face line indicates a strong, determined will, and is not desirable.

The **neck** of the draft horse should be at least medium long, and should be very muscular, with some degree of crest or arch to the

top. The crest should be pronounced in the stallion, but not so excessive as to break over to one side. At the junction with the body, the neck should be very deep, but at the throttle it should be very trim and rather cut up underneath, with no fullness or thickness there to bring pressure on the windpipe. The head and neck should be carried well up, to insure good vision, lighten the forehead, and improve the appearance.



FIG. 171.—A grand champion draft gelding. Master, an imported Clydesdale gelding, grand champion at the 1922 International Show. Exhibited by the National Biscuit Company of New York. Note the style and quality of this gelding, the correctly placed clean legs, sloping pasterns, and well-balanced conformation.

The **shoulders** should be very deep, muscular, and have much slope. An upright shoulder results in transmission of shock, and also in shortness of stride. A sloping, muscular shoulder that is laid in snugly is conducive to good action. Frequently, the shoulders are too open and prominent, so that the horse does not stand over his legs as he should. Such horses do not take a straight stride, but swing their legs outward when in action.

The tops of the shoulder blades should come well together so that the **withers** may be well defined, though muscular and not as sharp as in the lighter kinds of horses.

The **breast** should be wide and very muscular.

The **chest** should be full, wide, and deep, to provide room for heart and lungs. The horse is an athlete, and large lungs and good heart action are very essential. A contracted heart-girth shows lack of constitution. There is no such thing as too much heart-girth or chest capacity.

The **arm** should be very muscular, and should be thrown forward to give slope to the shoulder.

The **forearm** should be powerfully muscled, so that as viewed from the side it appears very broad next to the body, tapering to the knee. No muscles are present below the knees and hocks, hence the action is dependent upon the muscles above these joints.

The **knee** must be broad from every point of view, and must be deep from top to bottom. This provides a large joint, indicating strength. The knee must also be straight, so as to set the leg straight below the body. There must be no meatiness about the knee or any of the joints or parts below, for, as has been stated, all muscles end above the knee and are attached to the parts below by tendons. Meatiness about the knee interferes with the working of the tendons, and lessens the free and easy flexion of the joints. Hence the knee should be clean, flat across the front, and well defined. This is essential.

The **cannons** should be short and clean, with the tendons large and set well back from the bone. As viewed from the side, there should be good width, and the cannon should be flat instead of round. As one passes the hand along the cannon bone, it should feel smooth, hard, and dense. The skin and hair covering it should be fine. Between the bone and the tendons there should be well-marked depressions or grooves. Meatiness about the cannons is as objectionable as it is about the joints, and for similar reasons. The cannons furnish one of the best means of determining quality. Clean, flat, smooth cannons have bone that is composed of fine cells, and that is flinty in character. Coarse, rough bone is made up of large cells, and is porous and spongy. Too much refinement of bone is often found in the draft horse. On the other hand, large bone is frequently found which is very lacking in quality. There should be a combination of substance with quality. It is possible to make up in quality a certain lack of substance, but not the contrary.

The **fetlock joint** should be wide from front to back, clean, and well defined.

The **pasterns** should be oblique to relieve concussion, and should show reasonable length. A slope of about 45 degrees is desired. More slope than this tends toward weakness. The pasterns should show plenty of substance, yet be clean, and should spread out or expand at the lower end into wide, round, open hoof-heads or coronets.



FIG. 172.—The draft type. Big Jim, four times grand champion draft gelding at the International. J. H. S. Johnstone, of the Live Stock World, wrote the following regarding Big Jim when announcing his death in 1910: "There never was a prouder stepper in harness, and there never was a big one that held himself together and went at his work in a more sprightly manner. His size was immense—2,385 pounds—and not one of his competitors ever approached him in that regard. Personally I do not expect to see his like again."

Feet.—The old saying, "No foot, no horse," is full of truth. A draft horse of excellence in all respects except feet is as worthless as a fine building on a flimsy foundation. When it is considered to what great stress the foot of the draft horse is subjected, the wonder is that feet last as long as they do on hard pavements. Driven against cobble-stones and brick by the great weight of the body above, the fore feet undergo repeated shocks which soon bat-

ter to pieces feet that are defective. The foot should be large, to afford a large bearing surface. When viewed from front or side, the axis of the foot should coincide with the axis of the pastern. The hoof should appear dense, waxy, and smooth, indicating toughness and durability. The form of the hoof should be round. Inasmuch as the wall of the hoof grows out from the coronet or hoof-head, the size and shape of the foot will depend largely upon the size and shape of the hoof-head, which should therefore be large and round. A foot that is large on the ground and cramped and small at the hoof-head has too much flare of the wall to provide strength, and is not a good foot. The sole should be concave, as this means strength. Flatness of sole is a common fault among draft horses. The bars should be strong to insure against contraction of the heels, and the frog should be large and elastic. The heels should be very wide and fairly high, and the fore feet should be symmetrically made and uniform in size and shape. The position of the feet and legs should be as described in Chapter XXIX.

The **ribs** should be well sprung and deep, giving a wide, deep body. Such a conformation provides a strong middle-piece, gives the necessary weight to the animal, and indicates good digestive capacity, as well as ample room for heart and lungs. The distance from the last rib to the hip should be short, and the flank should be deep. Horsemen speak of a deep, full flank as a "good bread basket," and in certain sections of the country where a business is made of feeding drafters for market, care is taken to select animals for feeding that have deep, full middles, for the other kind are poor feeders and cannot easily be made fat. The horse that is cut up high in the flank is said to be "wasp waisted," "tucked up," or "washy." When put to work, such horses show lack of endurance or stamina, for they do not consume enough feed to replace the energy expended in doing hard labor; hence they become very thin in flesh, and are unable to do hard work for many days in succession. The middle of the draft horse in good flesh should be very large, and as round as a dollar.

The **back** forms the connection between the power, which is in the hindquarters, and the point of application of this power, which is the shoulder. A short, rather straight, broad back that is heavily muscled affords the strongest conformation. A short, wide back is not only more rigid than a long, narrow one, but also brings the power closer to the collar; it is therefore much desired because of its mechanical advantage over the long, rangy conformation.

The **loin** is usually called the "coupling." It lies just in front of the hips, and includes those vertebrae which have no ribs below them. The loin, like the back, should be short, broad, and heavily muscled.

Beginning with the **hips** and continuing throughout the hindquarters, we are dealing with the location of those muscles which furnish power for draft, hence we want an appearance of great massiveness everywhere. It used to be thought that the draft horse did his work simply by falling against the collar, thus bringing his weight to bear, and consequently that his forequarters



FIG. 173.—Six high-class well-matched draft geldings owned by Chestnut Farms, Walkersville, Md.

ought to be as heavy as possible; it was no harm if his shoulders were straight, and as for his hindquarters, it did not matter much what they were. But this idea has been exploded and it is now known that he pulls by muscle more than by weight, and much more by the muscles of his hindquarters than by those of his forequarters. So we want the hips of the drafter to be wide and heavily muscled, yet smooth.

A very broad and long **croup** gives the greatest area for the laying on of muscle. It should also be fairly level from hips to setting on of tail. A steep croup not only detracts from the appearance, but is also usually associated with shortness of croup, weak-

ness of coupling, and crooked hind legs. The croup should be covered with heavy, massive muscles.

The **tail** should be attached high, and should be full haired and well carried.

The **thighs** should be very wide and should bulge with muscle, and the quarters should be very deep and heavy. The stifle should likewise be heavily muscled, and there should be great width through the hindquarters from stifle to stifle. Viewed from the side, the thigh should be very wide from stifle to end of body.

The **gaskins**, like the forearms, should be very wide and bulging with muscle.

Hocks.—Suppose we have a pair of ton horses hitched to a big load. When the word is given to start, the horses extend and lower their heads, lean against the collar, crouch down behind by bringing their hind feet forward and flexing their hocks, and then the pull of the powerful muscles of the hindquarters extends the hock joint and straightens the hind leg, thus bringing great pressure against the collar, and the load moves. The point to be remembered is that an enormous strain comes upon the hock, and if there is any weakness in that joint it is certain to cause trouble. The hock must be large, clean, wide both ways, and deep, and the point of the hock should be prominent. It should be straight from top to bottom. Hocks that are badly sickled, bowed outward, or cow hocked are not stout enough to match the strength of the muscles above. They thus limit the power of the horse and are likely to become unsound. Fleshiness and puffs are distinctly objectionable. Thick, meaty hocks are too common in draft horses. A clean appearance, so that every angle and line of the joint is apparent, is very much desired.

The requirements for **hind cannons, pasterns, and feet** are almost identical with those in front. However, the hind cannons are always longer and usually broader than the front ones. Also, the hind pasterns are seldom so sloping, and the hind feet are not quite so large or round. There is less concussion behind than in front, but the stress is much greater at the pull, hence it is proper that hind pasterns and feet be a little more erect, in order to provide the necessary strength of conformation.

From what has been said above, the value of a properly set hind leg, as viewed from behind, is emphasized. If the horse is "bow legged," his legs will prove weak when the strain is put upon them. Walking on a crooked hind leg is comparable to driving a bent nail. The force of the hammer bends the nail instead of

driving it into the wood, and a crooked hind leg bows outward instead of remaining rigid and transmitting full force against the collar.

Now that the details of the drafter's conformation have been described, a word may be added regarding **symmetry** or proportionment of parts. The fact is that some horses are good in their various parts, yet fail to present a good appearance. What they lack is symmetry. The head may be good, and the neck may be good also, but the two may be joined at an angle which injures the appearance. The neck may not rise from the shoulders as it should. The feet may be good, but may be too small to be in proportion to the size and weight of the animal. The top line from head to tail



FIG. 174.—Heavy drafters in harness. This is the noted team of grays which was invincible at the leading shows a few years ago. They were shown both in the United States and Great Britain. Big Jim was the near wheeler in this team. Owned by Armour and Company of Chicago.

may be an irregular line full of angles, whereas it should be gracefully curved. The hips may be wide, which is desirable, yet they should not be wide out of all proportion to the rest of the body, so as to be ragged and prominent. Seemingly small factors such as these may or may not affect the horse's usefulness for work, but frequently they constitute the difference between a plain animal and one of show-yard character, between which there is a great difference in price. One horse looks as though he were made up of a lot of different-sized parts which do not fit well together, while the other seems cast from a carefully prepared mould. Standing in natural position, the symmetrical horse carries his head and neck well up, so that the face line, shoulder, and pastern all slope at nearly the same angle; the croup is fairly level from hips to tail,

the tail is set high, and all parts of his conformation are so proportioned as to give him a well-balanced appearance.

The action of the draft horse should be true, snappy, and bold. As you see him going or coming, the movement of the legs should be straight in the line of motion, the feet being carried true, with no paddling or irregularity of gait. Walking away from you, he should move with enough snap to give you the flash of his shoe at every step. As you view him in action from the side, he should



FIG. 175.—The draft horse in action. The champion Percheron stallion and noted sire, Carnot, owned by W. S. Corsa, Whitehall, Ill. This picture shows good action at the trot. The stride is long and true, with free flexion of knees, hocks, and fetlocks, and there is much evidence of boldness and power.

show length of stride and enough height of action to clear the ground safely at each step. High knee action is not essential; in fact, carriage horse action in a draft horse means useless expenditure of energy. However, there should be a strong, free movement of knees and hocks, without dragging or stiffness. The walk is the real gait of the draft horse, and an active, snappy, springy walk, with trueness and length of stride, is the prime essential so far as action is concerned. However, the trot often magnifies defects in gait so that they are more easily seen, and in show and

sale rings drafters are shown at both gaits. The stride in the trot should be long, true, springy, steady, businesslike, and moderately high. Horsemen like a bold way of going that indicates willingness and courage in the horse.

In action, the hocks should pass close together, so close in fact that they nearly brush each other. Some horses go so wide behind that a wheelbarrow could be put between the hind legs and scarcely touch them. Any tendency to spraddle behind is one of the greatest, if not the greatest, defect which the drafter can exhibit, so far as action is concerned.

The study of action is one requiring close attention. The observer must take into consideration every movement of the horse. Attention must be given not only to the movement of the feet and legs, but also to the carriage of the head and neck and the entire body. The head should be carried well up, giving a stylish appearance and a good outlook, and the top of the horse should be carried level and true, without any rolling or wobbling motion from side to side, and without any indication of lameness. The front and hindquarters should act in unison, and the legs should be kept well under the body as the horse travels, showing no tendency to drag the hind legs, and especially the hocks, out behind the body. When kept up underneath as they should be, and when all the motions of the horse are in unison, we say that he moves in a collected manner. As before stated, perfection in action can result only when there is a combination of proper conformation and strength, and a willing disposition.

Common defects in the action of draft horses are: (1) going wide at the hocks, (2) swinging the fore legs outward, called "paddling," (3) swinging in, (4) striking supporting leg with foot of striding leg, called "interfering," (5) twisting striding leg around in front of supporting leg, called "winding," "plaiting," or "rope walking," (6) short, stubby stride, (7) low, skimming action, called "daisy cutting," (8) unsteadiness of gait, (9) striking sole or heels of fore foot with toe of hind foot, called "forging," (10) excessive lateral shoulder motion, called "rolling," (11) lack of energy or snap, and (12) lameness.

On the matter of type.—To present the best appearance, the drafter should not be over-drafty in type; that is, shortness of leg and compactness and width of body should not be carried to the extreme. A certain degree of length of leg, length of neck, and length of underline is necessary, not only for the sake of looks, but also because it actually makes the horse more useful. He takes a

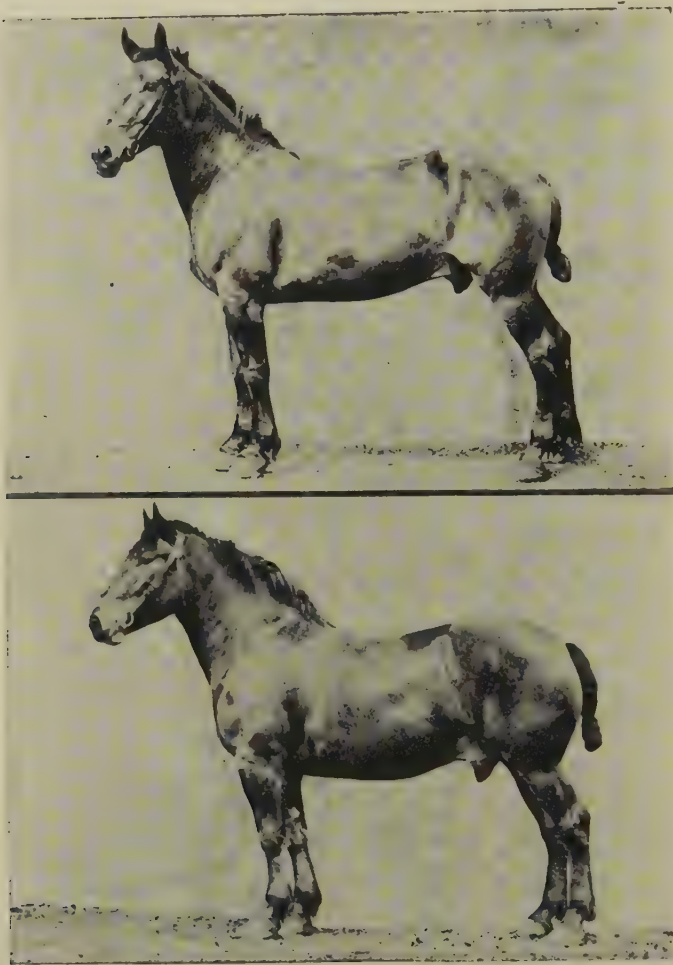


FIG. 176.—Before and after fattening. A gelding fattened by B. E. Carmichael of the Ohio Experiment Station. Fattening shortened the back, filled out the coupling, smoothed the hips, lengthened and levelled the croup, rounded out the middle, gave crest to the neck, transformed his angular lines into pleasing curves, and changed his worried expression of eye and ear to one of contentment, alertness, and spirit. The feet and legs, however, are not improved during the fattening period.

It might be assumed from these pictures that fat will transform the head, neck, and entire top of a horse from inferior to excellent. However, when fat this gelding does not have the big middle which a fat horse should have, neither does he show just the right lines and proportions. It is difficult to recognize the merits of a thin animal, and it is almost as difficult to see the faults of a fat one. The above pictures strikingly illustrate these facts.

longer step, and will do more work in a day than the extremely pudgy type of horse. On the other hand, we certainly do not want a horse that is all length and style. We must aim at the middle ground, selecting for as much style as may be had without sacrifice of any of those qualities which make the draft horse useful for his work.

Finish.—The term “finish” refers to fatness and to the condition of the coat. The horse market discriminates in price to a considerable degree between the fat drafter and the thin one, and it is surprising what an improvement is made in some horses by the addition of fat. Fatness adds to the weight, improves the form and spirit, and provides the necessary reserve store of energy to carry the horse through the first few weeks in the city during adjustment to city sights, sounds, loads, pavements, stables, and other new conditions. Although fat is important in the horse for sale or show, the judge must learn to distinguish between fat and muscle, and must not be deceived as to size of middle, spring of rib, or length of back and croup. The coat should be well groomed, so as to give the animal a sleek appearance.

Color.—It is commonly said that a good horse cannot have a bad color. By this is meant that color is disregarded if the horse suits otherwise. Some colors, however, are very generally disliked, and still other colors are not liked by some persons. For instance, duns, flea-bitten grays, white horses, very light grays, and spotted horses are universally discounted, either because they are hard to groom, hard to match, or because the color is unsightly. Dark colors, such as dark or steel gray, dark dappled gray, dark bay, dark brown, dark chestnut, dark roan, and black, are given preference. Dark dappled grays are well liked by buyers, and some firms will accept no other color because the flash gray color attracts attention to their turnouts. It is not uncommon for business houses to adopt some color as a sort of trade-mark, on account of the advertising value. However, color is of less importance in draft horses than in any other type. This is true because the drafter is a business horse, whereas other types are valued mostly for pleasure purposes.

Weight for age.—Draft horses that are properly fed and cared for usually reach at least 50 per cent of their matured weight at 12 months of age; 75 per cent at 24 months; 85 per cent at 36 months; 95 per cent at 48 months; and 100 per cent at 60 months. On this basis the horse that is to weigh a ton at maturity should weigh not less than 1,000 pounds at 12 months, 1,500 pounds at 24

months, 1,700 pounds at 36 months, 1,900 pounds at 48 months, and 2,000 pounds at 60 months. These are general averages. Variations will occur depending on feed, care, breed, sex, and individual. Belgians and Percherons mature somewhat earlier than Shires and Clydesdales. Mares and geldings mature quicker than stallions, but do not as a rule make as heavy weights at maturity. Some highly-fed colts and fillies make the weights mentioned at 12 and 24 months and then stop growing so soon that they fall considerably below a ton at maturity. This is especially true of yearlings and two-year-olds that have a compact, low-set form and finished appearance like a mature horse, instead of the growthy, rugged appearance characteristic of youngsters that ultimately reach real draft horse size and weight.

CHAPTER XXXII

THE CARRIAGE OR HEAVY-HARNESS HORSE

The carriage horse is also called the "heavy-harness" horse because he wears heavy leather in contrast to the harness worn by the roadster. The modern carriage horse is almost exclusively a pleasure horse. He is put before various kinds of pleasure vehicles ranging from the light runabout to the heavy coach, and it is therefore apparent that there should be a wide range in the size and

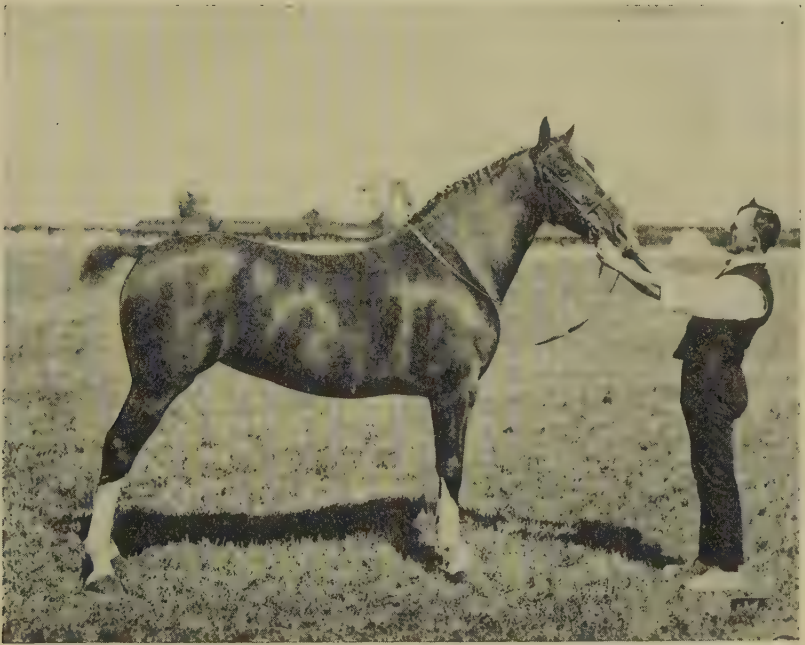


FIG. 177.—Carriage or heavy-harness type. Hackney mare, Queen of Diamonds, imported and owned by the Truman Pioneer Stud Farm, Bushnell, Ill.

weight of carriage horses, in order to meet the widely varying demands of the various vehicles and uses to which this horse is put. In other respects, all carriage horses are very nearly alike.

The value of the carriage horse is determined by (1) beauty of conformation, (2) action, (3) manners, (4) temperament, (5) color, and (6) endurance and durability.

1. **Beauty of conformation.**—The conformation of the carriage horse must show beauty, style, symmetry, and finish. Being a pleasure horse, it is the ability not only to do certain work which determines value, but to do this work gracefully, and to present while standing or in action, a picture of pleasing appearance.



FIG. 178.—The heavy-harness type in action. Hackney pony, Irvington Model, bred and owned by W. D. Henry, Sewickley, Pa.

2. **Action.**—Here again, beauty is the thing sought at the expense of other qualities. The carriage horse must not only go level, true, and collected, but he must go very high—the higher the better. With this end in view, he is bred, fed, shod, trained, bitted, and driven with a view to securing as much height of action as possible—not because it makes him more useful for his work, but because it makes him more pleasing to look upon.

3. **Manners.**—If the horse fails to respond to commands, possesses a strong will that rebels at these commands, or fails to act quickly, his lack of manners may result disastrously to the occupants of the carriage. Bad behavior while standing or in action also lessens the attractiveness of appearance. He must be so thoroughly trained and familiar with the commands of his driver that the execution of whatever is asked will be done involuntarily, unhesitatingly, and instantly. Every command of word, whip, or rein must be received intelligently, and intelligently acted upon by the horse.

4. **Temperament.**—The sanguine or nervous temperament is the one desired in carriage horses, for without it we cannot expect that degree of action which is required, nor that quickness of response to commands which is essential.

5. **Color.**—The dark solid colors are preferred, as being in proper accord with the elegant vehicles drawn by this horse. White ankles are often favored, because a horse so marked has his action emphasized and easily seen. Grays, roans, and light colors usually are heavily discounted or even rejected, and in horses for ladies' use even the white markings are discriminated against. True elegance and good taste are wanted, and this excludes colors that are flashy and calculated to attract undue attention.

6. **Endurance and durability.**—The carriage horse is required to make only short trips at moderate speed. Endurance is not so essential, therefore, as in other types. However, durability, which means wearing quality, is of great importance. Extremely high action makes necessary the best of feet and legs. Durability is almost entirely dependent upon the amount and quality of bone, and the structure and texture of feet.

DESCRIPTION OF THE TYPE

General appearance.—Compactness and fullness of form are required in order that the horse may fill his harness properly and be in proper keeping with the vehicles before which he is put. He must possess great smoothness of conformation, with all his lines curving rather than angular. He must appear snugly put together. Medium length of leg is required to give proper action and lend him style and symmetry. The height ranges from 14 to 16-1 hands, and the weight from 900 to 1,300 pounds. The greatest demand is for horses standing from 15 to 16 hands. Quality is indicated in bone, joints, hoofs, hair, head, and smoothness of form.

As the subject of quality has been fully discussed in connection with draft horse type, lengthy description is unnecessary here. Quality is valuable in the carriage horse because it assures durability, and because refinement and smoothness add beauty to the horse.

The **head** should be refined and well proportioned with every feature sharply defined. The forehead should be broad, and the eyes should be large and prominent. Strong jaws and a wide muzzle are desired, yet the muzzle must be trim, the lips thin, and the entire head free from any appearance of coarseness. The nostrils should be large. The ears should be fine, placed close together near the poll, and carried alert. The attachment with the neck must be clean and graceful. The appearance of the head should indicate intelligence, alertness, and quality.

Length of **neck** is very essential. It should be gracefully arched and bear considerable muscle,—enough muscle to lend fullness and strength, but not so much as to give an appearance of heaviness or coarseness. The upper border of the neck should be fine along its entire length. The neck should blend nicely with the shoulders. Without a high-class front, the horse cannot qualify as a heavy-harness horse of superior type.

Long, snugly laid **shoulders** that have a decided slope and are well muscled are wanted. The **withers** should be well set up and should show refinement. The **chest** should be moderately wide and very deep. The **breast** should be carried out prominently and be rather muscular.

The **middle** of the horse should be round, full made, short on top, and long below. This calls for long, well-arched ribs and good depth of flank. The back, and especially the loin, should be thickly muscled and short, giving strength and a smooth, finished appearance. Depth of flank is essential to a good appearance and good feeding qualities.

The **hips** should be smooth. Prominent hips detract from the smoothness of form which is so much desired. A long, level, fairly broad, well-muscled, and smoothly turned **croup** is the most attractive and the best indication of strength. The **tail** should be attached high and carried out from the quarters. Carriage horses usually have the tail docked and set. Full, muscular development of **thighs**, **quarters**, and **gaskins** gives the desired fullness of form and necessary strength.

Legs.—Superior quality of bone, associated with substance, should be evident in the canons. The arm should be very muscu-

lar. The forearm should be muscular and long. The knee must be wide both ways, deep, and clearly defined. The hocks should be wide, deep, straight, and clean. The cannons, both front and rear, as viewed from the side, should be broad and flat, with the grooves between the cannon bone and tendons easily seen and felt. Straight, strong fetlock joints are essential. The front pasterns should slope at an angle of about 45 degrees, and be long enough to give elasticity of stride, yet show sufficient substance to insure strength. Proper position of the legs is of greater importance in this type than in draft horses. So much of the value



FIG. 179.—The carriage horse in harness. Compare this picture with Fig. 182 and note the difference in height of action, type of vehicle, and weight of harness. This is the noted Hackney mare Bountiful, owned by Judge W. H. Moore of Chicago.

of the horse depends upon action, and so much of action depends upon proper position of the legs and feet, that great attention should be given to this point. The legs must come straight down and the toes point straight forward to insure true action.

Feet.—The size of the foot should be proportionate to the size of the horse. Roundness and size of hoof-head, width at the heels, and height at both heel and toe are important. The discussion regarding the sole, bars, frog, denseness of horn, etc., as given in connection with draft horse type, applies here with equal force.

Action.—The requirements of action in the carriage horse are: (1) trueness, (2) height, (3) length of stride, (4) collection, (5)

elasticity, (6) boldness and power, (7) gracefulness of movement, and (8) moderate speed. The walk must be snappy, quick, and businesslike to a marked degree. But it is at the trot that action is wholly revealed. The flight of each foot must be straight and true. The fore foot should be carried forward and high up, as if following the rim of a rolling wheel, and the stride should be long. The foot meets the ground easily and without apparent jar, in fact the step appears elastic, and the meeting with the ground seems to send the foot on again as though it were made of rubber. Every movement must show grace and style, and the whole



FIG. 180.—Sensational action. Little Ruby, a champion Hackney pony stallion owned in England.

attitude of the horse should be one of combined courage and power.

Proper folding of the knee meets only half of the requirement. Associated with this, there should be a decided flexing of the hock. The hind foot will leave the ground with snap and free movement of pastern, and the hock will be carried, not backward, but upward toward the dock, to accomplish which the hock must be flexed very decidedly.

Action is so valuable in the heavy-harness horse that breeders and dealers often resort to artificial means to secure it in horses

which are deficient in their movement. Heavy shoes produce height of action. The toe is allowed to grow out long which also adds weight to the foot and requires more effort on the part of the horse in breaking over as he takes a stride, so that when he does break over the extra force tends to carry the foot higher and farther away. No matter how natural it may be for a horse to go high, he still requires proper shoeing, biting, training, and driving, in order that his inherent ability may be developed. Even after the horse is "made," as the saying goes, if he is placed in the hands of an inexperienced reinsman, unskilled in driving heavy-harness horses, the result will be a failure. The trained carriage horse responds superbly under the guidance of the master reinsman. Given proper aids from word, whip, and rein, the horse instinctively responds with the best performance of which he is capable.

CHAPTER XXXIII

THE ROADSTER OR LIGHT-HARNESS HORSE

The roadster or light-harness horse is distinctly an American type, or strictly speaking, it is a breed—the American Trotter or Standardbred. The light-harness horse is a pleasure horse exclusively; his domain includes the regular race tracks, where he is used for professional racing, and also the city speedways and snowpaths and country roadways, where amateur racing and road driving are indulged in by men who admire the trotting horse and seek recreation in the open air. Roadsters or “gentlemen’s drivers” also form classes at our horse shows.

This type is styled “light-harness type” because, on both road and track, the horse works in light-weight harness that is quite in contrast to the heavy leather worn by the heavy-harness horse. The harness is light because the vehicles to which this horse is put are very light in weight. In professional racing the bike sulky is used, which weighs from 27 to 35 pounds; in matinee racing the vehicle used is a light speed wagon having four wheels but of the same general construction as the sulky, and weighing only 65 to 68 pounds. On the road the hitch is to a light wagon weighing about 175 pounds, which may have a top much like the common piano-box buggy. For snow racing a specially constructed speed sleigh is used, weighing a little less than 100 pounds.

The value of the light-harness horse is based upon (1) speed, (2) stamina or endurance, (3) durability, (4) temperament, and (5) beauty of conformation.

1. Speed.—Whether in use on or off the track, the light-harness horse is prized very largely for his speed. For racing purposes he is required to show 2:30 speed at the trot, or 2:25 at the pace, before he is considered a light-harness horse in the true sense of the word, and for road use he should be able to do at least ten miles within an hour. The ability to “get there” is the thing for which this horse is bred and trained. The world’s trotting record is now 1:56 $\frac{3}{4}$ (which means 1 minute and 56 $\frac{3}{4}$ seconds for the mile) and is held by Peter Manning, a gelding. The world’s pacing record is 1:55 $\frac{1}{4}$, held by the stallion Dan Patch. The fastest trotting and pacing records and the years when they were established are as follows:

Fastest trotting and pacing records^a

Trotting records		Pacing Records	
1 mile.....	Peter Manning (1922) 1:56¾	Dan Patch (1905).....	1:55¼
2 miles....	Peter Manning (1925) 4:10¼	Dan Patch (1903).....	4:17
3 miles....	Nightingale (1893)..	Elastic Pointer (1909)	7:31½
4 miles....	Senator L. (1894)....	Joe Jefferson (1891)..	10:10
5 miles....	Imogene Constantine (1919)	Weston Gentry (1921).	12:19½
10 miles....	Pascal (1893).....	.....	26:15
Stallion.....	Lee Axworthy (1916).	Dan Patch (1905).....	1:55¼
Mare.....	Nedda (1922).....	{ Miss Harris M. (1918)	1:58¼
Gelding.....	Peter Manning (1922)	{ Margaret Dillon (1922)	1:58¼
Yearling....	Airdale (1912).....	Winnipeg (1928).....	1:57¾
2-year-old...	Hanover's Bertha (1929)	Frank Perry (1911)...	2:15
3-year-old..	{ Mr. McElwyn (1924)	Calumet Adam (1929)	2:04½
	{ Spencer (1928).....	Highland Scott (1926)	1:59½
4-year-old...	Guy McKinney (1927)	William (1914).....	2:00
5-year-old...	Peter Manning (1921)	William (1915).....	1:58½
Under saddle	Country Jay (1909)..	George Gano (1915)...	2:10¾
Team.....	Uhlan and Lewis For- rest (1912).....	Minor Heir and George Gano (1912).....	2:02

2. **Stamina or endurance.**—Most racing, both amateur and professional, is at mile heats over half-mile or mile tracks. Some races are two in three, and some three in five, heats. Not until some horse has succeeded in winning the necessary two or three heats is the race decided. For this reason, some races extend into very gruelling contests. Some horses show a wonderful burst of speed for a quarter of a mile or so, and then quit. These horses are said to “lack bottom,” by which is meant a lack of stamina or endurance. Stamina means ability to go a mile at speed, and to repeat the mile, two, three, or more times, with intermissions of not less than 25 minutes. To accomplish this requires heart and lungs of the first order, together with a well-developed muscular system. On the speedway and snowpath there is a great deal of brush racing, that is, racing over short distances of varying lengths, depending on the wishes of the drivers and the ease or difficulty in passing opponents. This is usually not so severe as a regular racing program, provided the horse has been properly conditioned and trained.

3. **Durability.**—It is readily apparent that the work required of the light-harness horse is of such a nature as demands the best of feet and legs. This type of horse has a decided advantage over the carriage horse and drafter, in that he works on a much more yielding footing, yet the high rate of speed puts his feet and legs to a very severe test, and many horses with speed and stamina have their usefulness and value greatly lessened because of

^a The Horse Review, Dec. 11, 1929, p. 1220.

failure to keep sound when called upon to go through a strenuous racing campaign or do a large amount of work on the road.

4. **The temperament** must be decidedly sanguine, which gives courage, willingness, and promptness, with no sluggishness.

5. **Beauty of conformation** is a comparatively small factor in determining the value of light-harness horses for racing purposes. Some breeders have placed considerable emphasis on the matter of looks and attractiveness, but in general it may be said that



FIG. 181.—Roadster or light-harness type. Azoff, 2, 2:14 $\frac{1}{4}$; son of Peter the Great 2:07 $\frac{1}{4}$ and Dolly Worthy 2:27 $\frac{1}{4}$, by Axworthy 2:15 $\frac{1}{2}$. Owned by John R. Thompson, Libertyville, Ill. Azoff is the sire of the present world's champion trotter, Peter Manning 1:56 $\frac{3}{4}$.

beauty in the light-harness horse, while appreciated whenever it occurs, has not been fully emphasized by breeders, because they have been catering to the demand of the race track, and that demand is for speed above everything else. In selecting roadsters strictly for road driving, however, speed is not so important as endurance and the ability to make a long drive in creditable time, and for this work a horse of attractive, finished appearance is highly desirable. A big, strong, well-made horse, with quality,

a well-carried head and tail, light mouth, good manners, excellent feet and legs, and a long stride, is the sort best suited for road driving. In order to win prizes in the larger horse shows, attractive form and action, style, and beauty, combined with speed, are highly essential, and a height above 15-2 is preferred. But for racing purposes the almost exclusive requirements are speed, stamina, and durability.

DESCRIPTION OF THE TYPE

General appearance.—There is considerable variation in the size and general appearance of the light-harness horse. The demand for speed has been so great that breeders have been obliged to center their attention upon this one factor almost to the exclusion of other desirable features, including uniformity of type. However, in breeding for speed alone, certain other characters are bound to be impressed also. Speed in the light-harness horse is associated or correlated with refinement, endurance, and courage. Size, symmetry, and beauty are not correlated with speed except in the most general way. The light-harness horse varies in weight from 800 to 1,250 pounds, and in height from 14-2 to 16-1. Weights from 950 to 1,150 pounds and heights from 15 to 16 hands are most common. This type is rather upstanding, leggy, long, deep, narrow, and angular. Quality is shown by clean, smooth, dense bone; sharply defined tendons and joints; a chiseled, blooded-looking head; fine skin and hair; fine-haired mane and tail; and hoofs of smooth, dense horn.

The **head** should be refined and well proportioned, with a straight face line, a fine muzzle, large nostrils, and thin, trim lips. The eyes should be large, prominent, clear, and bright. The forehead should be high, broad, and full. The ears should be fine, pointed, set close, and carried alert.

A long, lean **neck**, with a fine throttle, is desired. Ewe necks are common. A straight neck, or one with slight arch, is preferable.

Long, smooth, sloping **shoulders**, fitted close to the ribs, and high, refined **withers** are essential.

The **middle** of the light-harness horse is characterized by a deep rib without much arch. The chest gets its capacity from depth, rather than from width. A straight, medium-short, well-muscled back and loin are essential. The underline is long, and the flanks should be well let down.

The **hips** should be of medium width. This type does not present as smooth a hip as the carriage horse. A little prominence of hip is not very objectionable, but if this is so pronounced as to give a rough appearance it is undesirable.

A long, level, muscular **croup** of medium width is best suited to this type. Defective croups are common. The **tail** should be attached high and well carried.

Long, muscular **thighs** give speed. Well-muscled **quarters** are necessary for strength.

Legs.—Length of leg is necessary for speed, yet there should be proper proportion between length of leg and size of horse. A



FIG. 182.—The light-harness horse in action. The Harvester 2:01, former champion trotting stallion, driven by Ed Geers. Owned by C. K. G. Billings of New York.

shallow body set up high on very long legs is not a good type. The arm should be muscular, and carried well forward, while the forearm should be long and muscular, with a nice tapering to the knee. This provides room for the long muscles associated with speed. The knees must be clean, bony, straight, broad, deep, and strongly supported. The cannons should be broad, with large, clean tendons set well back from the bone. Straight, wide fetlock joints and strong, sloping pasterns of good length are very necessary. The fore leg must be straight, and the toe should point directly forward, to insure trueness of action. A long, muscular gaskin is an important requirement. This brings the hocks far below the point

of the buttock, which is essential in securing speed. Clean hocks that are wide, deep, straight, with prominent point, and well supported below are very necessary. The hind legs must be set straight, with the toes pointing straight ahead. Sickle-shaped hind legs are rather too common.

Feet.—The best of feet are necessary. Although this type is usually afforded an easy footing, nevertheless the tremendous concussion puts the feet to severe strain when the horse travels at speed. At high speed, a stride of 19 or 20 feet is attained. Imagine the force of the concussion when a 1,000-pound horse strides 20 feet in less than half a second, as is the case when the horse is trotting at a two-minute gait. The feet should be well-developed, uniform in size, point straight forward, and slope at the same angle as the pastern. The horn of the hoof should be dense and smooth, the sole should be concave, the bars strong, the frog large and elastic, and the heel wide and open.

Gait.—Both pacers and trotters are found among light-harness horses. These gaits differ from each other in that the pace is a lateral motion in which the fore and hind leg of the same side act together, while the trotter moves diagonally. A change of a few ounces in the weight of a shoe often transforms the gait. Many horses hold records at both gaits. The pacing gait is about two seconds faster for the mile than the trot, but it is not so popular with horsemen as the trotting gait, especially for road driving. With the pace there is often associated a decided rolling of the body, which is disliked, the pull on the vehicle is jerky, and the pacer does not work well in the mud or where the going is heavy. The natural pacer also frequently possesses a steep croup, short underline, and sickle-shaped hind leg.

Action.—The walk should be true, quick, elastic, and regular. The trot, in order to be fast without undue tiring of the horse, must be straight and true, with regular, even, long stride. Height of action is of little importance; in fact, the less knee and hock action the better. It is only important that the foot clear the ground, accompanied by enough action of knee and hock to secure length of stride. There should be no hitching or unsteadiness of gait, and no great tendency to break when going at speed. The action should be what is sometimes termed "frictionless," giving one the impression of a perfect mechanism that can travel at greatest speed with no waste of energy. It is apparent that much of the success of the light-harness horse depends upon good action, and good action, in turn, is dependent largely upon proper position of

the legs. Defects in conformation result in knee knocking, speedy cutting, over-reaching, and other faults of action.¹

Common defects in the action of light-harness horses are (1) swinging the fore feet inward, instead of carrying them straight away, (2) a stride in which extension is more marked than flexion, and in which the heel of the foot strikes the ground first, called "pointing," (3) pause in flight of foot before foot reaches ground, called "dwelling," (4) striking sole or heels of fore foot with toe of hind foot, called "forging," (5) striking supporting leg with foot of striding leg, called "interfering," (6) hitting front of hind foot, above or at line of hair, against toe of fore foot as it breaks over, called "scalping," (7) the trotter at speed often goes rather wide behind, and he sometimes strikes his hind leg, above the scalping mark, against the outside of the breaking over fore foot, called "speedy cutting," and (8) "cross firing," a fault in pacers corresponding to forging in trotters.

The condition of the light-harness horse is in marked contrast to the types previously described. When in desirable racing condition there seems to be a total absence of fat from the muscles. A clean-cut, sinewy appearance indicates proper racing trim. For hard use on the road a fat horse is almost equally objectionable. The fat horse is soft, sweats easily, and tires quickly. However, proper condition is not secured by giving short rations. The roadster should be well fed, and kept in proper condition by plenty of exercise.

Color.—A study of the American Trotting Register, which is the stud book in which Standardbred horses are recorded, indicates that the colors per thousand horses are as follows: 605 bays, 140 chestnuts, 130 browns, 85 blacks, 25 grays, 13 roans, and 2 duns. The first four colors—bay, chestnut, brown, and black—are liked best. Grays, roans, and duns are not so popular.

¹Faulty shoeing also frequently causes faulty action. Correct shoeing frequently overcomes or minimizes natural faults in action.

CHAPTER XXXIV

THE SADDLE HORSE

Any horse used for riding might be called a "saddle horse." But there is a certain type of horse best suited to carrying a man in safety and comfort, and this is the type to bear in mind when thinking of saddle horses. The horse of all pioneer peoples is the saddler. In new countries, before the opening of roads, the saddle horse is of greatest usefulness. When the country becomes settled and roadways are opened and improved, other types of horses quickly appear, and there is less and less real necessity for the saddle horse; but the saddler never disappears from any community because he is highly prized as a horse for pleasure and recreation.

When roads were being opened in the states along the eastern seaboard and the roadster began to gain popularity, Kentucky, Missouri, and the West were yet a country of bridle paths, and there the saddle horse was held in high esteem. In 1818 a traveler through the Kentucky blue-grass region reported that "the horse, 'noble and generous' is the favorite animal of the Kentuckian, by whom he is pampered with unceasing attention. Every person of wealth has from ten to thirty, of good size and condition, upon which he lavishes his corn with a wasteful profusion." Besides Kentucky and Missouri, the states of Virginia and Tennessee have been intimately connected with saddle horse development in America. These four states produce many excellent saddle animals annually.

Today, saddle horses are used in a business way by the cavalry of the United States Army and National Guard, by the mounted police of the larger cities, by cattle drovers in rural districts, by cattle buyers and salesmen at the large live-stock markets, by ranchers in the West, and by overseers and managers of large plantations and farms in the South, East, and Central West. However, the high prices for saddle horses are paid by people to whom the saddler is a pleasure horse. In city parks and on country roads are to be seen many excellent saddle horses used strictly for pleasure and recreation.

All good saddle horses possess a general type which we may call "saddle type," but the uses made of saddle horses are so varied that several varieties or sub-types of the saddle horse exist, each

possessing a distinct type of its own. The most important of these sub-types are (1) the five-gaited saddler, (2) the three-gaited horse, (3) the hunter, and (4) the polo pony. All of these are pleasure horses. The running horse or race horse, the cavalry horse, and the western cow pony are other sub-types adapted to certain special uses, but the following discussion is confined to the four first mentioned. A brief description of the cavalry horse will be found in the chapter dealing with market classes of horses.

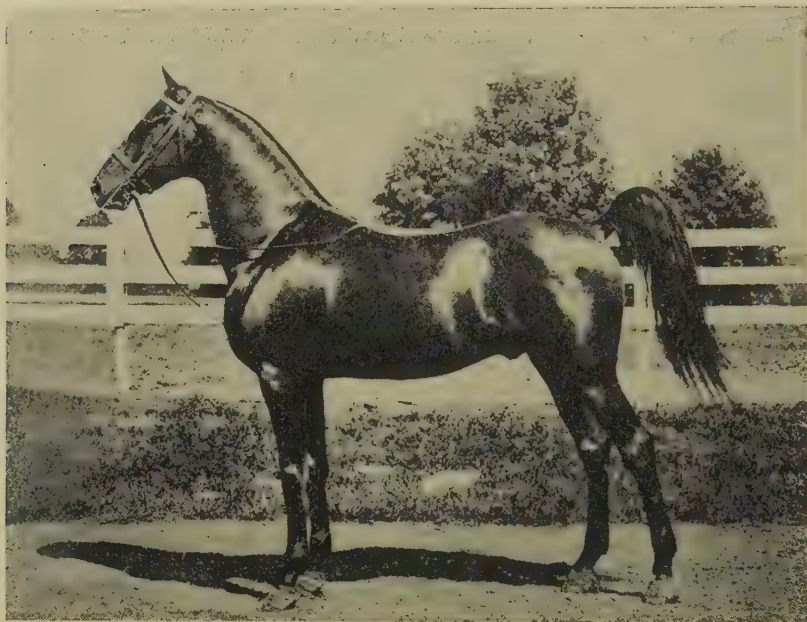


FIG. 183.—Five-gaited saddle horse. The noted prize-winning stallion, Kentucky's Choice, owned by Mrs. R. Tasker Lowndes, Danville, Ky.

The Five-Gaited Saddle Horse

The five-gaited saddle horse is also known as the American Saddle Horse, this being the name of the breed which supplies practically all horses of the gaited class. To classify as a five-gaited horse, the saddler must have at least five gaits, four of which must be the walk, trot, canter, and rack. In addition to these four, the horse must have one or more of three slow gaits—the running walk, fox trot, and slow pace. The gaited saddler is the horse that has made Kentucky and Missouri famous. There he is looked upon with great admiration, and bred and trained with great care.

General appearance.—The breeders of this type lay stress upon

loftiness of carriage, airiness of movement, refinement, intelligence, docility with high spirit and courage,—withal, great beauty in every detail of conformation, without any sacrifice of those qualities which insure durability and creditable performance of the work demanded of a saddle horse. A leading Kentucky breeder presents the points of the typical five-gaited saddle horse in the following brief paragraph:¹

“The typical saddle horse does not differ materially from other light horses in conformation. The characteristics peculiar to the type are a long, clean neck, sloping pasterns and shoulders, withers moderately high and narrow, a short and compactly coupled back, smoothly turned quarters, and a well-set, high-carried tail. In action there should be promptness, ease, and precision in going from gait to gait, and absolute straightness and evenness in each. The rack should be smooth, swift, and without side motion of the body or legs, the trot should be fast and without offensive flashiness, the canter should be slow with no increasing speed, the flat-footed walk should be springy and reasonably fast, while the running walk, or fox trot, should be easy and comfortable and equal to about five miles an hour.”

Gaits.—In a wild state the natural gaits of the horse were four in number—the walk, trot, pace, and gallop or run. Under domestication these gaits have been variously modified and additions made for saddle purposes. These additions and modifications are largely the result of the selection for breeding purposes of those animals most readily acquiring the desired gaits when trained to them. The gaits desired in the five-gaited type of saddle horse are as follows:

Walk.—The flat-footed walk should be springy, regular, and reasonably fast.

Trot.—This is a diagonal gait, the off fore foot and near hind foot striking the ground together, the body being then propelled forward from this support and sustained by the near fore foot and off hind foot. It is a “two-beat” gait. The trot should be fast, with only moderate height of action, extreme knee action being undesirable. Many otherwise excellent saddle horses cannot trot well, “pointing” and coming down on their heels, instead of exhibiting a well-balanced trot.

The canter is a restrained gallop. It is slower than the gallop and easier to ride. With proper training, the horse easily acquires

¹ Bit and Spur, Sept. 1912, p. 22.

this gait. It should be slow, with no increasing speed. The canter is not considered perfect until the horse can perform it at a rate no faster than a fast walk. To "canter all day in the shade of an apple tree" is a saying sometimes used to describe the canter of a highly trained saddler that can canter very slowly and in a small circle. A well-trained horse will change lead in the canter, and start with either foot leading, at the will of the rider.



FIG. 184.—The saddle horse in action. Edna May, undefeated five-gaited mare ridden by Mat S. Cohen, Lexington, Ky. Owned by Mrs. R. Tasker Lowndes, Danville, Ky. This picture shows correct degree of knee and hock action and proper carriage of head and tail.

The rack is a four-beat gait, each foot meeting the ground singly, all the intervals being equal. Hence it is sometimes called "single foot." This gait may be distinguished by the ear alone, because the foot-falls are rapid enough to produce a characteristic clatter. The rack is taught by urging the horse with the whip or spurs and restraining by the curb. This breaks up the movement of a slow gait, and the restraint is sufficient to prevent a free trot or canter, so that the horse flies into a rapid four-beat gait. The rack is easy for the rider, hard for the horse. It is showy, and some horses can perform it at great speed. This gait has been

officially named the "rack" by the American Saddle Horse Breeders' Association, hence the name "single foot" should not be used. It should be smooth, swift, and without side motion of the body or legs.

The slow pace, sometimes called the "stepping pace," is the true pace so modified that the impact on the ground of the two feet on a side is broken, the hind foot touching first, thus avoiding the rolling motion of the true pace. The slow pace is a comfortable and attractive gait. Many trainers do not favor it, for the horse easily falls into the habit of taking the true pace which is not a desirable saddle gait because it is rough and uncomfortable. The true pace is the worst gait a saddle horse can possess; the rider cannot rise to it and save himself as in a trot.

The fox trot is a slow, short-striding trot. It is not so popular as the running walk. It is a broken-time gait and difficult to describe. Some riders, when asked to exhibit the fox trot, simply restrain their horses to as slow a trot as possible, seeking to pass that off as a fox trot, but the true fox trot is not accompanied by restraint.

The running walk is a slow gait, as are also the slow pace and fox trot. The running walk is faster than a flat-foot walk and is taught by gently urging the horse out of the ordinary walk, but restraining him from a trot or rack. It is intermediate between the walk and rack. The movement of the legs is more rapid than in a walk, but in about the same rhythm. The true running walk is usually characterized by a bobbing or nodding of the head, and, in some instances, by a flopping of the ears, in unison with the foot-falls. It is an all-day gait, easy and comfortable to both horse and rider, and equal to six miles an hour or more. It is, however, not as showy or attractive as the other gaits.

The Three-Gaited Saddle Horse

This type is also styled the "walk, trot, canter horse," and the "park hack." This is the horse which conforms to English fashions, whereas the five-gaited saddler is exclusively an American type.

General appearance.—The walk, trot, canter horse and the five-gaited horse have much the same general appearance. Many three-gaited saddlers are American Saddle Horses which, for one reason or another, are marketed as three-gaited horses. There are also a large number of walk, trot horses which are of Thoroughbred breeding, and some have a strong infusion of Standardbred

breeding. In such cases, the head and tail are not carried so high, and there is not the high degree of style in form and action which characterizes the horse that is of American Saddle Horse breeding.

Gaits.—This horse must show three gaits, and three only; the walk, trot, and canter. It is as objectionable for a three-gaited horse to show more than the gaits mentioned as for the five-gaited horse to know less than five gaits.



FIG. 185.—The three-gaited saddle type. Lady Margaret, an excellent type of walk, trot, canter horse, owned by Polka Dot Farm, Scarborough-on-Hudson, N. Y.

While many people have adopted the walk, trot, canter horse in preference to the five-gaited type because they accept English horse fashions as law, there is still another reason why the American type with its five or more gaits is not favored by all riders. The reason is that there is no advantage in having a horse with all the gaits unless the rider is skillful enough to keep them distinct. If the rider is less instructed than the horse, a sad confusion of paces is apt to result. A well-mouthed, well-supplied horse with a good trot and a good canter is more useful to the ordinary

rider than is one of the highly accomplished gaited saddlers; hence the popularity of the three-gaited horse, especially in the larger cities.

Outside of the matter of gaits, the requirements for the five-gaited and three-gaited types are so nearly identical that one discussion will suffice for both.

REQUIREMENTS OF THE SADDLE HORSE

The essential points to be looked for in a saddle horse are (1) beauty of conformation, (2) sure-footedness, (3) comfortable seat, (4) best of manners, (5) knowledge of the gaits, (6) endurance and durability, and (7) dark solid color.

1. Beauty of conformation.—Attractiveness of form and action is almost, if not quite, as valuable in the saddle horse as in the carriage horse. People who ride for pleasure take as much pride in the ownership of an attractive animal as do the owners of carriage horses.

2. Sure-footedness.—Saddle action must, first of all, be safe and sure. A horse inclined to stumble is dangerous and cannot be highly valued for saddle purposes.

3. Comfortable seat.—Though a horse be sure-footed, he will not be of much use or value for saddle work unless he gives his rider a pleasant ride. Rough-gaited horses are not useful saddle horses.

4. Manners.—The intimate relation between horse and rider calls for the very best of manners. Conduct that would be tolerated from a horse in harness may be very disagreeable if the horse is under saddle. The very nature of the use to which the saddler is put makes manners one of the prime essentials.

5. Knowledge of gaits.—To a considerable extent the value of the saddle animal is measured by his knowledge of the gaits. As this is largely a matter of training, it is placed fifth in the list of requirements. There must be no mixing of gaits; each gait must be distinct, and the horse should change gaits promptly and easily at the signal from the rider.

6. Endurance and durability.—This implies a good middle and enough substance combined with quality of bone and joints to insure good wearing qualities.

7. Color.—Dark colors are much preferred, including bay, brown, chestnut and black. Flashy colors such as dapple gray, roan, dun, cream, white, and parti-color are too conspicuous for ordinary saddle use.

DESCRIPTION OF SADDLE TYPE

Size and weight.—These are quite variable depending on the character of the work and the weight of the rider. The height is usually from 15-1 to 15-3 hands, and the weight from 1,000 to 1,150 pounds. For the purpose of comparison the heights and weights of the various sub-types of saddle horses are here given:

Type	Height	Weight
Five gaited	15 —16	900—1,200
Three gaited	14-3—16	900—1,200
Hunter	15-2—16-1	1,000—1,250
Cavalry	15 —16	950—1,200
Polo pony	14 —14-2	850—1,000

Conformation.—The saddle horse is considered by many people to be the most stylish, beautiful, and finished of all horses. The principal requirements in conformation are (1) a long, refined neck, (2) nicely sloping pasterns and shoulders, and (3) moderately high and refined withers. The lines of the head should be cameo-like in sharpness and clean-cutness. An ideal saddler will naturally have a head showing an usually kind disposition and high intelligence, for the intimate relation between horse and rider demands the best of manners in the horse and thinking ability on both sides. The head should be set at the right angle on a very long, refined, nicely arched neck. Unless there is lots of horse in front of the saddle, the appearance is spoiled, and a horse with a short, straight, heavy neck is not easily controlled. There should be easy flexion of jaw and neck, and this is possible only with a long, refined neck, properly arched. However, a “weedy” neck, that is, one lacking in muscular development, is not wanted. Much attention must be given to the slope of pastern and shoulder, for straight pasterns and shoulders are more objectionable in the saddle horse than in any other type because they are almost certain to make the horse a hard rider. Height and refinement of withers are necessary for a similar reason. Horses that are low in the forehead are not comfortable to ride. Furthermore, the saddle cannot be made secure on round, flat withers, this being particularly true of the side saddle. The extension of the shoulder into the back and shortness and strength of coupling are very important. A straight or roached back does not afford an easy ride; there should be a certain degree of springiness, without any weakness or sway-backed conformation. The saddle horse is somewhat upstanding, and the head and tail should be smartly carried.

Refinement and finish.—The saddle horse should possess a high degree of quality, and lots of smoothness from end to end. There

should be greater refinement of head, ear, and bone than in the heavy-harness type of horse. The shoulders should be well laid in, and the hindquarters smoothly turned. The smoothness of the typical saddler is in marked contrast to the angular appearance of the roadster. Rotundity of body is a highly desirable feature. Levelness of croup is more important in the saddle horse than in any other type; if a horse has a steep croup, the defect is magnified a great deal when the saddle is placed upon his back, and he presents a plain appearance.

Action.—The action should be energetic, elastic, of moderate height, and especially there should be trueness of motion in all gaits. Gracefulness and ease of action are very desirable. A springy step resulting from sloping pasterns and shoulders is more essential in the saddle horse than in any other type. A straight-shouldered and -pasterned horse gives one a ride like a carriage without springs. Collected action, by which is meant harmony or unison of movement between fore and hind legs, is necessary for gracefulness and comfort. It also means that the legs will be kept at all times under the weight, thus permitting of quick turns or any other evolutions desired. Collected action is largely a result of properly training the horse, and skill on the part of the rider. By pressure of the leg, or use of the whip or spur, the horse is kept alert, with his hind legs well under him, while the hands bring sufficient pressure on the mouth to restrain the movement slightly, arch the neck, and secure a slight yielding of the jaw. If the action is not collected, the horse moves awkwardly and executes sudden commands in a clumsy fashion.

Temperament and disposition.—The temperament should be sanguine, as in all other light horses. The disposition should be kind, willing, honest, and courageous. There should be docility with high spirit and animation.

CHAPTER XXXV

THE HUNTER AND POLO PONY

The hunter and polo pony differ rather markedly from the two types of saddle horses described in the preceding chapter, largely because they are required to do work of a highly specialized nature in which performance is of greater importance and beauty less valued than with the gaited horse and park hack. Hence, the hunter and polo pony are given separate consideration in order that their peculiarities of type and requirements may be better emphasized.

The Hunter

The hunter is the type used in following the hounds in fox hunting. He must be up to carrying his rider at good speed over long distances across country, jumping fences and ditches when called upon to do so. Like the park hack, this is an English type. The American demand for this horse is limited, but the supply is more limited, and some high prices have been paid for hunters in this country.

From the nature of the work, the hunter must be a horse of more size, ruggedness, and constitution than the other types of saddle horses. He must be a stayer at hard work, a jumper, and a horse of courage and decent manners. His bone must be of good size and of the right quality, and there must be an evidence of strength throughout his conformation. Otherwise he cannot long withstand the hardships of the hunting field.

Height and weight.—With reference to height, much will depend upon circumstances. Weight-carrying hunters are always more difficult to procure, and command higher prices. Short, light-weight men prefer 15-2 hands to 15-3, but where fences are high, tall horses are necessary. Some hunters are nearly 17 hands. Hunters are classed as light, middle, and heavy weight according to their size and weight. Most of the hunting horses in use range in height from 15-2 to 16-1 hands, and in weight from 1,000 to 1,250 pounds.

The **general appearance** of the hunter should be that of a thin-skinned, big-boned, small-headed, fine-shouldered, deep-chested, clean-legged animal, with a neatly turned, compact body, and hav-

ing a facial expression of great keenness, docility, and quick perception.

The head should be refined; the forehead straight; the eyes large and prominent; the ears erect and thin; and the skin covering the head and face should also be thin, rendering the various prominences upon the skull easily apparent. The high-class hunter should have a mild, keen, and extremely intelligent expression.

The neck must be long, narrow towards the poll, and the head should be carried obliquely, a lofty carriage being undesirable in



FIG. 186.—A typical hunter. Surprise, a winner at the Royal Hunter Show and many other shows in England. Owned by Sir Merrick Burrells.

the hunter. As the shoulders are approached, the neck should increase in width, be of moderate thickness, and clean along its upper border, with a closely-cropped mane. Many hunters are very weedy in the neck, and if this is the case, the horse is unable to recover himself in the event of a fall, as the muscles of the neck materially assist in raising the forepart of the body in its attempt to regain balance.

The upper border of the neck should pass into high withers, and most of the best hunters are high in this region.

When judging hunters, attention must be fixed upon the **shoulders**, not only while the horse is at rest, but also when jumping, as good shoulder action is one of the most important points in a hunter. In action it must be free and full, yet fine, because if the shoulders are logged up with muscles (heavy shoulders), the free action is interfered with when jumping.

The **chest** must be deep; in fact, it is self evident that a hunter should be "well-hearted" in order to provide plenty of space for the



FIG. 187.—The hunter in action. Edward B. McLean's Alarms jumping at the National Capitol Horse Show, Washington, D. C., ridden by Louis Leith.

free play of heart and lungs under extreme exertion. Width of chest is not required and often means bulky shoulders.

A slightly flat side is desirable, though the **ribs** must not be short, otherwise the horse becomes "tucked up" or "washy" in appearance.

The **back** and **loin** should be of medium length, and the latter must be broad and clothed with powerful muscles, passing into neatly turned **quarters**—the so-called "goose rump" being of objectionable conformation.

The **arms** should be strong and powerful; the **forearms** of good breadth above and ending below in broad-jointed, clean **knees**. A stiff knee is certainly detrimental, as is also low daisy-cutting action, as such horses cannot freely flex and extend their joints during the leap.

The **thighs** and **gaskins** must be neatly turned, and clothed with powerful muscles. Particular attention must be paid to the **hocks** and to hock action; the hock joints must be broad, deep from front to back, clean in outline, and covered with thin skin.



FIG. 188.—A hunt team and pack of fox hounds.

The **cannons**, **fetlocks**, **pasterns**, and **feet** demand special examination. The so-called "clean" legs are indispensable, and every horseman knows the meaning of this term. Associated with cleanliness must be considerable substance. The fetlocks must be capable of full flexion. The ideal pastern is one with a moderate degree of slope, broad in front, deep from front to back, and well rounded at the sides. It should be covered with thin skin. Pasterns that are too long, too oblique, or light in the bone, are of bad conformation; and short, upright pasterns are extremely objectionable for very evident reasons. The feet must be concave on their lower surface, proportionate in size, of good shape, well open at the heels, neither contracted nor cracked.

Color.—In selecting a hunter, color seldom plays any part, and

in the hunting field are horses of almost every color. Bay, brown, light or dark chestnut, and gray are the principal colors, more especially bay and brown, with either white or black points.

Disposition is of great importance in order to insure the safety of other horses, the hounds, and the rider. Some hunters are tremendous pullers, in fact, defy all attempts to hold them. There is great difference in temperament and disposition; one hunter will rush at his fences in a reckless and headstrong way, and another will even walk to his jump and clear it in a businesslike manner. It is because so many Thoroughbreds have bad dispositions, that horses having a small amount of draft blood are often more desirable as hunters than are those of straight Thoroughbred breeding.

Production of hunters.—There is no breed of hunters. They are largely of Thoroughbred breeding, about seven parts Thoroughbred and one part cold (draft) blood being a generally accepted formula in breeding hunters. This proportion is secured by mating a three-quarter-blood mare with a Thoroughbred stallion of correct type to get hunters. The infusion of cold blood gives greater size and ruggedness and a better disposition, but is said to lessen to some extent the staying qualities and gameness of the animal. Some most excellent hunters have come of straight Thoroughbred breeding. Ireland has long enjoyed a wide reputation for the rearing and sale of the best hunting horses, the name "Irish hunter" carrying the idea of super-excellence in this type of horse.

The Polo Pony

Modern polo is largely a rich man's game. It is played with four mounted men on a side, the object being to drive a wooden ball between goal posts at the ends of a field 300 yards long and 120 to 150 yards wide. Each player carries a long-handled mallet of regulation design. It is a very fast game for both ponies and men, requiring quickness and precision.

History of polo.—Polo existed in Persia and Turkey before the tenth century. Thence it spread to Central Asia, Thibet, and Central India, being found at Calcutta in the fifteenth and sixteenth centuries. It is said to have also existed in Japan a thousand years ago. English officers returning from India in 1874 started polo at the Hurlingham Club, Fulham, England. Hurlingham has since been recognized as the great center of the sport, and the rules it has laid down have been accepted as authority in every country except America, where a few changes in these rules have been made.

The game was introduced into this country in 1876. When first introduced, the ponies used were 13-2 hands high, but larger and faster ponies were found more advantageous. The present rules limit the height of ponies to 14-2 hands or under, but this rule is not strictly enforced; the modern game is played at such high speed that only big 14-3 to 15-hand Thoroughbred or three-quarter-blood ponies are considered good enough for important matches. The range in weight is from 850 to 1,000 pounds.

Demand for good ponies.—There was a time when western cow ponies made acceptable mounts for the game, and a small percentage of these developed into really good polo ponies. In almost every



FIG. 189.—Polo pony of excellent type. Owned by L. Waterbury and ridden by him when a member of the American team which won the International Cup from England.

case, however, the best modern ponies were sired by Thoroughbred stallions. English ponies used for polo have always carried more or less Thoroughbred inheritance; they are bred in the purple, trained two years, and carefully stabled and fed. In 1909 the American team which went to Hurlingham to compete for the world's championship was enabled to win largely because of the excellence of their ponies. These ponies were English-bred, and were reported to have cost high prices ranging up to \$5,000. In championship contests, four to six ponies are used by each player

and some players maintain a big string of ponies from which to make selections for games.

What constitutes a good polo pony?—The polo pony must combine speed with weight-carrying ability. He must be wiry, agile, and under proper training must acquire ability to quickly start, stop, and wheel. He must have a light mouth. He must be intelligent and learn to like the game and follow the ball. The disposition must be such as insures a level head, doggedness, docility, courage, and quickness. A pony that pulls hard or becomes wild in a fast scrimmage, or swerves off the ball, is useless in first-class polo.



FIG. 190.—The polo pony in action.

The game calls for lots of endurance and wearing quality, hence the conformation of middle, hindquarters, feet, and legs largely determines a pony's adaptability for the game. The object of breeders is to produce a pony 14-2 hands high, able to carry from 168 to 200 pounds for ten minutes in a fast game.

The polo pony should be built like a weight-carrying hunter. His head should be well set on, wide between the jaws, with plenty of room at the throttle. He should have a big, clear, sound, prominent eye; small, pricked ears, indicative of alertness; a well-formed, well-arched, and muscular neck; a fine sloping shoulder; not too fine at the withers, and his breast should be ample and in proportion to the remainder of the forequarters. His forearms should be big and powerful, the knees wide, particularly good under the knee,

with a short cannon. The fetlocks should be large and clean, the pasterns well supplied with bone, and of proper slope and strength. The foot should be of good size, smooth, nicely shaped, the heels open, and the frog well developed and elastic.

He should be deep from withers to sternum, and fairly wide through the chest; he should be short in the back, well coupled, ribbed close up to the hip, with plenty of muscle behind the saddle. His thighs and quarters should be big and powerful, and the gaskin should bulge with muscle also. The hock should be broad and flat, with the natural prominences clean-cut and well developed. The tendon of Achilles should be well defined and powerful. There should be great bone below the hock, and in other respects the hind leg should be similar to the fore one.

Production of polo ponies.—At present the only method of producing ponies such as the modern game demands is the mating of polo pony mares with a Thoroughbred stallion of approved type. However, a very large percentage of get is over height and only a small percentage of foals that are of proper size have the conformation and disposition to become polo ponies. The breeding of this pony is a proposition only for the specialist who makes a special study of the requirements of players and of methods of production.

CHAPTER XXXVI

MARKET CLASSES OF HORSES

The present rank and importance of the leading horse markets is shown by the following figures giving the receipts of horses and mules for three years, as reported by the U. S. Bureau of Agricultural Economics:

Receipts of horses and mules at leading markets in three years

Market	1929	1928	1927
1. St. Louis	70,502	70,094	68,871
2. Kansas City	52,400	43,354	44,067
3. Fort Worth	42,304	43,429	42,555
4. Memphis	41,366	29,321	51,814
5. Atlanta	28,555	32,272	33,144
6. Denver	22,451	23,544	26,775
7. Omaha	20,991	17,743	15,579
8. Chicago	18,826	19,390	15,732
9. Wichita	17,997	23,475	23,638
10. St. Paul	17,768	11,363	10,580
11. Sioux City	17,492	13,340	12,635
12. Buffalo	16,882	16,794	10,869
Totals	367,534	344,119	356,259

Methods and cost of marketing.—G. E. Wentworth, superintendent of the horse market at the Union Stock Yards, Chicago, states: ¹

"Carloads of horses for sale on the Chicago market receive the best handling when consigned to reliable commission men. They can be sold privately or at auction. The usual custom is for the shipper to accompany his horses, arriving at the market on Friday or Saturday, selling as many at retail as he can on Saturday and Sunday morning up until 10 o'clock, which is when the Chicago market closes on Sunday, putting the rest of his horses into the auction on Monday or Tuesday. The shipper gets his position in the auction according to the order in which the horses are removed from the cars.

"The feed rates on the Chicago market are at present \$1.25 for the first day and \$1 for each succeeding day per horse. The commission for selling is \$3 a horse. Nearly all the shippers find it advantageous to employ a "swipe" to put their horses in condition. They all braid and sack their horses' tails before going into the auction, as it makes them look more attractive. Some horses are sold shod and some unshod. The shoeing rates in Chicago are \$1 per shoe, at

¹ Breeder's Gazette, Feb. 22, 1923, p. 258.

present. Exclusive of the freight, shippers tell me that their expenses can be figured to average at least \$8 a horse in Chicago."

Auction rules.¹—At the large horse markets, horses are sold at auction under certain rules which are well known and understood by all horsemen who buy or sell at these markets. As the horse comes into the auction ring, a clerk on the auctioneer's stand displays a placard on which appears in large letters the rule under which the animal will be sold, such as "Sound," "Serviceably sound," "At the halter," etc. The rule under which the horse is sold is a guarantee made by the seller to the buyer. The buyer has until noon of the following day to refuse the horse, if upon examination and trial he finds that the animal is not as represented.

The definitions of the principal rules which govern the sale of horses are given below. Exceptions to these rules may be announced from the auction stand, pointing out the defects, in which case they are recorded and go with the horse.

1. *Sound*.—Perfectly sound in every way.

2. *Serviceably sound*.—Virtually a sound animal, barring slight blemishes which do not interfere with his usefulness in any way. His wind and eyes must be good, but a spot or streak in the eye which does not affect the sight will be considered serviceably sound as long as the pupil of the eye is good. He must not be lame or sore in any way.

3. *Wind and work*.—The only guarantee this carries with it is that the animal has good wind and is a good worker.

4. *Work only*.—He must be a good worker, but everything else goes with him. No other guarantee than to work.

5. *Legs go*.—Everything that is on the animal's legs goes with him; nothing is guaranteed except that he must not be lame or crampy. He must, however, be serviceably sound in every other respect.

6. *At the halter*.—Sold just as he stands without any recommendations. He may be lame, vicious, balky, a kicker, or anything else. The purchaser takes all the risk. The title only is guaranteed.

Market requirements.—The factors that determine how well horses sell upon the market are soundness, conformation, quality, condition, action, age, color, training, and style. These, together with some minor considerations, are discussed below.

¹ Illinois Bulletin 122, Market Classes and Grades of Horses and Mules, by R. C. Obrecht, has been used as the basis for much of this chapter and Chapter XXXIX. The student will find it well worth while to refer to this bulletin, especially for the excellent illustrations which it contains.

Soundness.—The market demands that a horse be serviceably sound, by which is meant one that is as good as a sound horse so far as service is concerned. He may have slight blemishes, but nothing that is likely to cause lameness or soreness. He must be good in wind and eyes, but may have small splints and puffs, and a little rounding on the curb joint. Broken wind; thick wind; side-bones; unsound hocks such as curbs, spavins, and thoroughpins; large splints; and buck knees are discriminated against.

Conformation.—If a horse is to do hard work, with a minimum of wear, and give the longest possible period of service, he must possess a conformation indicative of strength, endurance, and longevity, the indications of which are good feet, a good constitution, good feeding qualities, good bone, and symmetry of confor-



FIG. 191.—Horse market at the Union Stock Yards, Chicago. Winding and trying out horses immediately after purchase. If the horse is found to be not as represented at time of sale, the buyer has the privilege of returning him to the seller.

mation. Conformation has been discussed fully in connection with the various types described in preceding chapters, and no further discussion is necessary here.

Quality in a horse is of great importance, as has already been emphasized. A horse lacking in quality is a comparatively cheap animal.

Condition.—To be appreciated on the market, a horse must be fat and possess a good coat of hair, which gives him a sleek appearance. Condition is most important in draft, chunk, and wagon horses. When a green horse goes to the city, he loses weight during the first few weeks until he becomes used to the new conditions, and it is a decided advantage if he enters city work carrying a high finish. When a horse is fed to a high state of fatness it in-

variably improves his spirit and style, as well as his form and weight. In some individuals, fat covers many faults. The man who sends his horse to market in finished form is offering the animal in most attractive condition. Condition is a very important item of value on the horse market.

Action has been fully discussed in preceding chapters. We have seen that the requirements vary according to the type of horse, and that action is always a very important item of value, in some instances being as important a factor as any in determining the value of the horse.

Age.—Horses sell best from five to eight years old. Heavy horses, such as drafters and chunks, sell best from five to seven years old, but a well-matured four-year-old in good condition will find ready sale. Carriage, saddle, and road horses sell better with a little more age, because they do not mature so early and their education is not completed as soon as that of heavy horses. They are most desired from five to eight years old.

Color.—As a rule, the color of horses is of secondary importance, provided they possess individual excellence. Previous discussions of the various types have shown that color is of more importance in pleasure horses than in those used for business and utility purposes.

Training and disposition.—Every class calls for a horse of good disposition and well educated for his work. Mere "greenness" in a drafter, however, does not affect the price much if he is free from vice and bad habits, but carriage and saddle horses must be thoroughly schooled in order to realize good values.

Sex is not of great importance in the market. However, geldings sell better than mares for city use, as there is some liability of mares being in foal, and if not, the recurrence of heat is objectionable. For farm use and southern trade, mares are preferred, because farmers buy horses with the expectation of breeding them.

The breed to which a horse belongs has but little or no influence upon his market value as long as he has individual excellence.

Style and freshness.—If able to shape themselves well in harness, very plain horses often make a stylish showing, and this increases their value materially. They should be spirited and energetic, which generally comes from being well fed. They should be well groomed, the hair being short and sleek, lying close to the body, and possessing a luster which indicates health. Clipping of the foretop and legs should not be practiced in the case of heavy

horses, as it is an indication of staleness or second-hand horses. The presence of the foretop and feather leaves no doubt as to freshness from the country. The feet should be in good condition and of a good length hoof, which is necessary to hold a shoe.

Breeders make no real effort to supply some of the market classes of horses, either because the demand is very limited or the price too small. Such classes are supplied by careless breeding, by the mixing of types, and by the misfits which result even when the breeding of horses is conducted as carefully as possible.

The classification outlined below includes not only those classes of horses which are regular commodities on the large horse markets, but also other classes which are only to be had from certain dealers and breeders who cater to an exclusive trade not represented at the large markets:

General class	Class	Height Hands	Weight Pounds
DRAFT HORSES.....	Heavy Draft	16 to 17-2	1,750 to 2,200
	Light Draft	15-3 to 16-2	1,600 to 1,750
	Loggers	16-1 to 17-2	1,700 to 2,200
CHUNKS.....	Eastern Chunks ...	15 to 16	1,300 to 1,550
	Farm Chunks	15 to 15-3	1,200 to 1,400
	Southern Chunks ..	15 to 15-3	800 to 1,250
WAGON HORSES.....	Expressers	15-3 to 16-2	1,350 to 1,500
	Delivery Wagon ...	15 to 16	1,100 to 1,400
	Light Artillery ...	15-2 to 16	1,150 to 1,300
	Heavy Artillery ...	16 to 17	1,400 to 1,700
	Fire Horses	15 to 17-2	1,200 to 1,700
CARRIAGE HORSES...	Coach Horses	15-1 to 16-1	1,100 to 1,250
	Cobs	14-1 to 15-1	900 to 1,150
	Park Horses	15 to 15-3	1,000 to 1,150
	Cab Horses	15-2 to 16-1	1,050 to 1,200
ROAD HORSES.....	Runabout	14-3 to 15-2	900 to 1,050
	Roadsters	15 to 16	900 to 1,150
SADDLE HORSES.....	5-Gaited Saddler ...	15 to 16	900 to 1,200
	3-Gaited Saddler ...	14-3 to 16	900 to 1,200
	Hunters	15-2 to 16-1	1,000 to 1,250
	Cavalry Horses	15 to 16	950 to 1,200
	Polo Ponies	14 to 14-2	850 to 1,000
MISCELLANEOUS.....	Feeders		
	Range Horses		
	Ponies		
	Plugs		
	Weeds		

Draft Horses

A full description of the draft type has already been presented, so that it is only necessary to mention here the chief distinctions between the three market classes, Heavy Draft, Light Draft, and Loggers.

Heavy drafters are the heavier weights of the draft class; they stand from 16 to 17-2 hands high, and weigh from 1,750 to 2,200 pounds.

The light drafter is similar in type to the heavy drafter, but is smaller; they stand from 15-3 to 16-2 hands, and weigh from 1,600 to 1,750 pounds. While 15-3 hands is accepted as the minimum height for light drafters, it should be understood that a 15-3-hand horse is less desirable than a taller horse, and he borders closely on the class known as eastern chunks.

Loggers are horses of draft type that are bought for use in the lumbering woods. This trade demands comparatively cheap horses, yet wants them big and strong. Because of the prices paid,



FIG. 192.—Eastern chunk.

the trade is usually compelled to take the plainer, rougher horses of the heavy draft class, and some are slightly blemished or unsound, such as "off in the wind," small sidebones, curbs, wire marks, etc. Loggers should stand from 16-1 to 17-2 hands, and weigh from 1,700 to 2,200 pounds.

Chunks

The term "chunk" is significant of the conformation of most of the horses in this group. Chunks are of three classes, Eastern, Farm, and Southern.

Eastern chunks.—At one time this class was known as Boston chunks, but as the trade has widened to other cities they are known

by the general name of eastern chunks. They are most generally used in pairs or three abreast to do the same work as draft horses; but may be used in pairs, in a four-in-hand, or in a six-in-hand team. The eastern chunk may be briefly and accurately described as a horse of draft horse type in all respects except size and weight. He is, then, a little drafter. He is usually a little more low set and compact than the true drafter. He stands from 15 to 16 hands high, usually not over 15-3, and weighs from 1,300 to 1,550 pounds, depending upon size and condition. Being required to do his work mostly at the walk, his action should be similar to that of the draft horse.

Farm chunks.—Horses of this class may be found on the market at all seasons of the year, but during the spring months they form an important feature of the trade. They are bought to be used on the farm, and are in most urgent need during the season when crops are being planted. They are usually of mixed breeding, draft blood predominating, and are commonly known among farmers as "general-purpose" animals. Mares are more generally taken than geldings. For this class, low-set, compact horses are wanted, not so heavy as the eastern chunks. Farm chunks are usually lighter in bone, and often slightly blemished or unsound. In general, the typical farm chunk should be a moderate-sized, all-around good individual, standing from 15 to 15-3 hands high, and weighing from 1,200 to 1,400 pounds. Being lighter horses than the eastern chunks, they should be a little quicker and more active. The varied use to which horses are put on farms requires ability to trot readily if necessary. However, since the walk is their most important gait, they should be good walkers and do it with ease and rapidity.

Southern chunks.—In some markets these are termed "southern horses" or "southerns." They are small horses that are taken by dealers to large southern cities and sold to southern planters for tilling their lands and for driving and riding. The southern farmer does not cultivate deeply, and the soils are light, consequently he does not require very large horses. However, each year the trend of the market is for larger horses for this trade. Southern chunks are small horses standing from 15 to 15-3 hands high, and weighing from 800 to 1,250 pounds. They are rather fine of bone, possessing an abundance of quality, and are more rangy in conformation than any of the other chunks, having more of the light horse blood. Many of them are similar to the cheaper horses used on the light delivery wagons of cities. They should have good action. The southern chunk is comparatively a cheap horse.

Wagon Horses

These are horses useful for quick delivery. The demand is from cities and towns. They must be closely coupled, compactly built, with plenty of constitution and stamina. They must be good actors, have a good, clean set of legs, with plenty of bone and quality, and a good foot that will stand the wear of paved streets. The classes are Express Horses, Delivery Wagon Horses, Light Artillery Horses, Heavy Artillery Horses, and Fire Horses. Their breeding is a mixture of draft and light bloods. They are neither light nor heavy horses, but may be termed middle-weights.

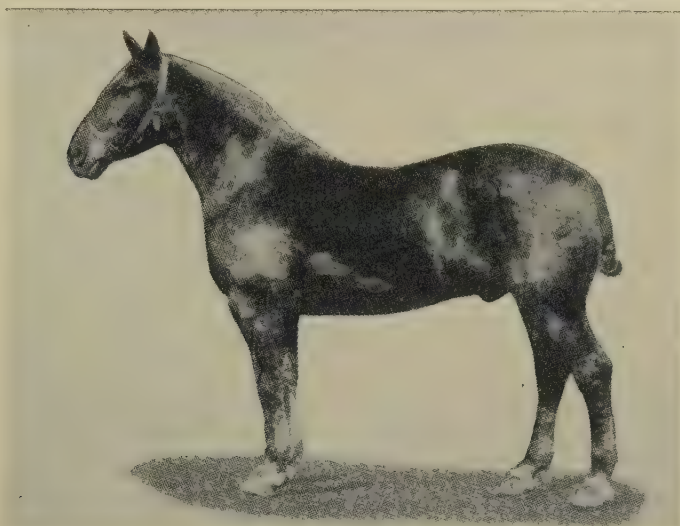


FIG. 193.—Express horse. This horse was purchased by the American Railway Express Company as a six-year-old in 1909. When photographed in March, 1922, he had been in steady service on city streets for 13 years, weighed 1,525 pounds, and stood 16 hands high.

Express horses are used by express companies to collect and deliver goods to and from railroad stations. Different companies use horses of slightly different size and weight. For instance, if the business of a company is centrally located in a city, and depots are not far apart, they use larger horses and load heavier; if the business is done in the outlying parts of a city, and the depots are a considerable distance apart, lighter horses with more action are wanted. They are used singly or in pairs, and the size of the horse will depend on the weight of the wagon. The lightest ones are called "money horses," as they are hitched to the lightest wagons to deliver valuables, this kind of work demanding quick service.

The typical expresser is rather upstanding, deep bodied, and closely coupled, with good bone and an abundance of quality, energy, and spirit. He should stand from 15-3 to 16-2 hands high, and weigh from 1,350 to 1,500 pounds in good flesh; the average express horse is 16 to 16-1 hands high, and weighs around 1,400 pounds in working condition. His head should be neat, his neck of good length, and his crest well developed. His shoulder should be obliquely set, coupled with a short, well muscled back and a strong loin. His croup should be broad, rounding, and well muscled, his quarters deep, and thighs broad. He should not be "goose rumped," nor cut up in the flank. His underpinning should be of the very best, his cannons broad and clean, and his hoofs of a dense, tough horn.



FIG. 194.—Light artillery horse.

The express horse is required to do his work both at the walk and trot, the latter being the principal gait. He should be quick and active, and should keep his feet well under him and throw enough weight into the collar to move a heavy load at the walk, or a lighter load at the trot. As in the previous classes, he should be a straight line mover, with possibly a little more knee and hock action.

Delivery wagon horses are not as large as expressers, and not as high-grade animals; most mercantile firms are not such liberal buyers as the express companies, and consequently they get a cheaper grade of horses. However, this is not always true, as some

of the large department stores, whose deliveries serve as an advertisement, will pay more for the very best than express companies, thus getting very choice animals. The conformation requirements are practically the same as for express horses, except they are not quite so large, standing from 15 to 16 hands, and weighing from 1,100 to 1,400 pounds. The action requirements are the same as for express horses, though some are not as good actors. The demand for delivery wagon horses comes from all kinds of retail and wholesale mercantile houses, such as meat shops, milk houses, grocery houses, dry goods firms, and hardware merchants, for use on light wagons for parcel delivery. Some of the coarser, rougher ones are used on the huckster wagons, junk wagons, sand wagons, and by contractors for cellar excavating, street cleaning, railroad grading, or almost any kind of rough, heavy work.

Light artillery horses conform rather closely to the better grades of delivery wagon horses of the same weight. The following specifications, prepared under the direction of the Quartermaster General of the U. S. War Department, clearly set forth the requirements:

"The artillery horse for light and horse batteries must be sound, well bred, of a superior class, and have quality; of a kind disposition, well broken to harness, and gentle under the saddle, with easy mouth and gaits, and free and prompt action at the walk, trot, and gallop; free from vicious habits; and otherwise to conform to the following description: A gelding of specified color (no white or gray horses will be accepted), and in good condition, from 5 to 8 years old at time of purchase; height from 15-2 to 16 hands; weight from 1,150 to 1,300 pounds, depending on height. Horses otherwise satisfactory which fall short of, or exceed, these limits of weight by not more than 50 pounds, due to temporary conditions, may be accepted.

"The artillery horse for light and horse batteries is required for quick draft purposes, and should be heavy enough to move the carriage ordinarily by weight thrown into the collar rather than by muscular exertion. Long-legged, loose-jointed, long-bodied, narrow-chested, coarse, and cold-blooded horses, as well as those which are restive, vicious, or too free in harness, will be rejected."

Heavy artillery horses.—The U. S. Army specifications for artillery horses for siege batteries are as follows:

"A gelding conforming to the above specifications for horses for light and horse batteries, except that the animal should be from 16 to 17 hands high, and weigh from 1,400 to 1,700 pounds, depend-

ing on height. A smart, active, draft horse, with plenty of bone and substance, and enough quality to insure staying power in fairly fast work, is required for this service."

The work of the heavy artillery horse is much heavier and slower than that of the light artillery horse, and the type demanded in the horse is quite different. Here it is a question of power rather than of speed, and the heavy artillery horse is in fact a light draft horse, though some fall somewhat short of the weight desired in light drafters. Heavy artillery horses might properly be classed with draft or chunk horses, but for convenience are included in the same general class as the light artillery horses.

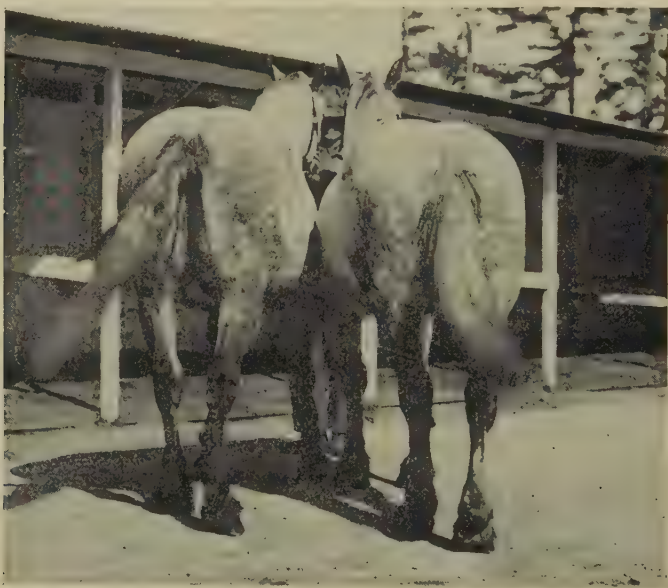


FIG. 195.—Heavy artillery horses.

The demand for artillery horses is rather spasmodic, at some times being much greater than at others. Contracts are given to the lowest responsible bidder to supply them in large numbers at a specified time. Because of the rigid examination and requirements of official inspectors, some men have lost money in filling contracts.¹

The fire horse is more rangy in conformation than the expresser, he being required to throw weight into the collar and often

¹ During the World War, or from 1914 to 1918 inclusive, the United States exported 1,054,000 horses, valued at \$219,459,000, and 357,255 mules, valued at \$70,926,000.

to take long runs. The requirements are very rigid, as will be seen by the specifications set forth by Peter F. Quinn, former superintendent of horses of the Chicago Fire Department:

"The work required of a horse best suited to fire department services necessitates almost human intelligence. Such a horse must not only be well bred, sound in every particular, quick to observe, prompt and willing to respond to every call, but as well, ambitious to discharge his numerous and unusual duties under constantly differing surroundings. In selecting, the first requisites are tractability, good feet and legs, with bone and hoof of the best texture, a short, strong back, and well-proportioned fore and hind-quarters, well covered with firm, elastic muscles. For heavy engine companies and heavy hook-and-ladder trucks, a gelding of uni-



FIG. 196.—Fire horses.

form and hardy color, in good condition, from 5 to 7 years old, standing 16 to 17-2 hands, and weighing from 1,500 to 1,700 pounds should be selected. Hose-carriage horses, same age; weight from 1,200 to 1,400 pounds; height, 15 to 16-2 hands."

The demand for fire horses is very limited, coming from fire companies of cities. There are usually enough horses in the general supply to meet the demand.

Carriage Horses

The chapter dealing with carriage horse type presents a detailed description of the general class known as carriage horses, and while this general class is subdivided into four classes known as Coach, Cob, Park, and Cab Horses, nevertheless the differences between them relate mostly to size and weight, and much the same conformation, style, and action is desired in each of them.

Coach horses may be described as carriage horses of large size. They should stand from 15-1 to 16-1 hands high, and weigh from 1,100 to 1,250 pounds. The weight is not so important as the size. The essential thing is to get a horse that looks right before the large, heavy vehicle to which he is hitched, such as the park drag, body break, road coach, and brougham. A hearse requires black horses from 15-3 to 16-1 hands high, weighing 1,200 to 1,250, and without white markings. White horses are also used to some extent by undertakers.

Cobs differ from coach horses in size and in the use to which they are put. They are driven singly, in pairs, or tandem. Cobs stand from 14-1 to 15-1 hands high, and weigh from 900 to 1,150 pounds. The strongest demand comes for horses 14-3 to 15 hands high, and weighing from 1,000 to 1,100 pounds. Being essentially a lady's horse, solid colors are wanted, without flash markings. They are usually hitched to a light brougham or phaeton.

The park horse, sometimes called the gig horse, is a carriage horse of medium size, and he is a higher-priced horse than either the coach or cob horse. He has the same conformation and action as they, and there may be no difference in size and weight, but his conformation is more perfect, his action higher and more sensational, and his style and elegance more outstanding. Park horses are hitched to a cart or gig, or may be driven tandem to the latter vehicle. They are also driven in pairs before mail phaetons and victorias. The limits for height and weight are 15 to 15-3 hands and from 1,000 to 1,150 pounds, the most desirable height being 15-1 to 15-2 hands, and the weight from 1,000 to 1,100 pounds.

The cab horse is a comparatively cheap horse, and the requirements are not so rigid as for coach, cob, or park horses. They are used on cabs, coupes, hansoms, and other vehicles for public service in cities. They are much the same type as the coach horse, in fact many of them are the discarded and lower grades of the coach class. Cab horses stand from 15-2 to 16-1 hands high, and weigh from 1,050 to 1,200 pounds. The demand comes from livery and transfer companies.

Road Horses

This class includes Runabout Horses and Roadsters. Runabout horses occupy an intermediate place between typical roadsters and carriage horses, but on account of their action, conformation, and the use to which they are put, they may be more properly classed as road horses.

The runabout horse is a rather short-legged horse, standing from 14-3 to 15-2 hands high, and weighing from 900 to 1,050 pounds. His head should be neat, ear fine, eye large and mild, neck of good length and trim at the throttle. The neck should be of medium weight, not quite so heavy as that of the coach horse, and not so light and thin as that of the roadster. The shoulder should be obliquely set, the withers high and thin, the back short, well muscled, and closely coupled to the hips by a short, broad loin. The barrel should be deep and round, the ribs well sprung, and the chest deep; the croup should be long and the hips nicely rounded. The



FIG. 197.—Runabout horse.

legs should be well placed and heavily muscled, the bone broad and clean, and the pasterns of good length and obliquely set, joined to well-shaped feet. The runabout horse is not quite so stockily built as the cob, being not so heavy in neck and crest, not so full made and rotund in body, and not so heavy in quarters. The action is more moderate than that of a cob; he does not need to be as high an actor, but should have more speed. The action should be bold, frictionless, and straight, such as is conducive to speed and beauty of form.

The demand for runabout horses is for single drivers. They are used in cities and elsewhere on runabouts and driving wagons. They are of more or less mixed breeding, Standardbred breeding predominating.

Roadsters.—The chapter dealing with light-harness or roadster type sets forth the requirements for roadsters in form, action, and speed, and discusses the uses to which they are put. No further discussion is needed here.

Saddle Horses

The saddle horse group includes the five classes known as Five-Gaited Saddlers, Three-Gaited Saddlers, Hunters, Cavalry Horses, and Polo Ponies. All of these except the cavalry horse have received full consideration under the subject of types of horses in preceding chapters.



FIG. 198.—Cavalry horse.

Cavalry horses.—The Quartermaster General of the War Department has sent out the following specifications as the requirements for an American cavalry horse:

“Each horse will be subjected to a rigid inspection and any animal that does not meet with the requirements should be rejected. No white or gray horses will be accepted. The mature horse must be sound, well bred, of a superior class, and have quality; gentle and of a kind disposition; well broken to the saddle, with light and elastic mouth, easy gaits, and free and prompt action at the walk, trot, and gallop; free from vicious habits; and otherwise to conform to the following description: A gelding of specified color, in good condition, from 5 to 8 years old at time of purchase; weighing

from 950 to 1,200 pounds, depending on height, which should be from 15 to 16 hands."

Cavalry remounts for the U. S. War Department are purchased as needed through contract orders, the contract being let to the lowest responsible bidder. In filling orders, dealers are often obliged to educate many of the recruits to the saddle, in order to meet the specific requirements.

Miscellaneous Horses

Feeders are horses thin in flesh which are purchased to be put in condition and resold. They may belong to any of the above classes, but the practice is more generally applied to draft horses,

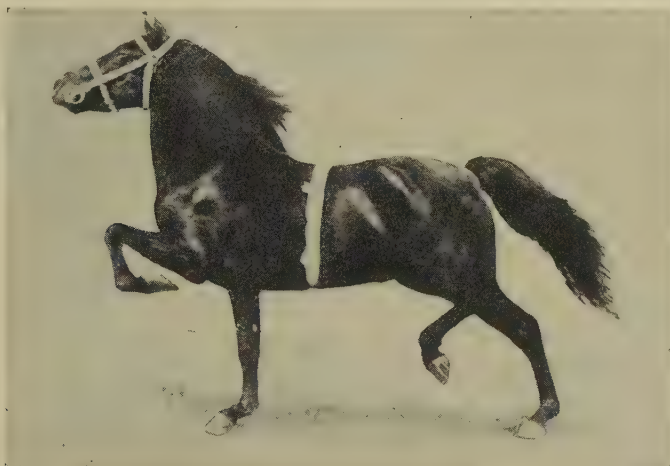


FIG. 199.—High-class pony. King Larigo, champion Shetland pony stallion at a large number of the leading shows in recent years. Owned by George A. Heyl, Washington, Ill.

chunks, and wagon horses. The old adage, "a little fat covers a multitude of defects," is still true; the value of flesh when put on thin horses can hardly be appreciated, unless one has seen them fleshed and placed again on the market.

Range horses.—During certain seasons of the year, there may be found on the market horses bred and reared on the range, commonly known as "range horses." They are divided into two general classes, light and heavy, according to the predominance of light or draft horse blood. For the sale ring, each of these classes is divided into carlots as follows: "colts," meaning weanlings; "ones," the yearlings; "twos," the two-year-olds; "dry stuff," the three-year-olds and over, those not suckling foals; and "mares and

colts," the brood mares with foals at foot. In the auction ring, the price is stated per head and the buyer takes the entire lot. Most of the range horses find their way to the country, where they are usually broken; when educated, they may be returned to the market and may fill the demand for some of the commercial classes.

Ponies of various grades and breeding are frequently found on the market, and are usually bought for the use of children and ladies. The characteristics distinguishing ponies from horses are not easily described. The principal distinguishing feature is that of height, a pony being 14 hands or under. But there are dwarf horses that do not have pony blood or characteristics that come within these limits. Other pony characteristics are a deep body with rounding barrel, heavily muscled thighs and quarters, croup not drooping, and width well carried out, all of which the small horse does not usually possess. The neck is often short and heavy, though this is not a desirable quality. Ponies are essentially children's horses, and they must be kind and gentle in disposition with as much spirit as is compatible for their use. There are no special requirements for weight, the limits being quite wide. They should be straight-line movers, and the more knee and hock action they possess, the higher prices they will bring, other things being equal. The Indian pony, or "cayuse" as he is sometimes called, is larger; he is a descendant of the native range stock, and is classed on the market as a range pony.

Plugs are worn-out decrepit horses with but little value. This class is too well known to need description.

Weeds are leggy and ill-proportioned horses lacking in the essential qualities, such as constitution and substance. They have little value for service of any kind.

Prices for Horses at Chicago

Prices of the various classes compared.—Prices during 1929 averaged as follows upon the Chicago market, figures for preceding years being given for comparison:¹

Class	1929	1928	1927	1926	1925
Draft horses.....	\$165	\$165	\$175	\$165	\$150
Farm chunks.....	100	90	90	80	80
Express horses.....	145	145	150	140	140
Delivery wagon horses.....	140	125	125	125	115
Saddle horses, medium quality.....	200	150	150	125	125
Saddle horses, good to choice.....	850	750	750	750	500

¹ Drovers Journal Year Books of Figures.

The foregoing is a rather incomplete report, but it is all that is available. The total value of all horses received at Chicago in 1929 was \$2,729,770, and their average value was \$145. The average was \$140 in 1925, \$180 in 1920, \$180 in 1915, and \$170 in 1910. In connection with these figures it should be remembered that many of the best loads of horses from the corn belt are taken directly to the eastern cities for sale, being gathered by country buyers who consign them to eastern dealers.

CHAPTER XXXVII

HORSE BREEDING

The following figures reported by the U. S. Department of Agriculture show the rank of the leading countries in numbers of horses:

Numbers of horses in leading countries

Country	Year	Total horses
1. Russia	1929	33,355,000
2. United States	1929	13,905,000
3. Argentina	1923 ¹	9,432,000
4. Brazil	1920	5,254,000
5. China ²	1929	4,500,000
6. Poland	1929	4,047,000
7. Switzerland	1929	3,718,000
8. Canada	1929	3,376,000
9. France	1929	2,936,000
10. Australia	1928	2,041,000
11. Rumania	1929	1,945,000
12. Great Britain	1928	1,731,000
World total	1923 ¹	106,400,000

¹ Average, 1921-1925.

² Including Manchuria.

The distribution of horses in the United States is shown by the numbers in the leading states and in the various geographical divisions, as estimated by the U. S. Department of Agriculture:

Leading states in numbers of horses on farms, January 1, 1929

State	Number	Average value	State	Number	Average value
1. Iowa	1,046,000	\$78	6. Nebraska	764,000	\$60
2. Illinois	839,000	77	7. South Dakota ..	593,000	57
3. Minnesota	787,000	82	8. North Dakota ..	589,000	52
4. Texas	780,000	46	9. Missouri	574,000	53
5. Kansas	766,000	49	10. Wisconsin	544,000	102

Distribution of horses on farms by geographical divisions on January 1, 1929

Division	Number
North Atlantic Division.....	996,000
South Atlantic Division.....	640,000
North Central, East of Mississippi River.....	2,829,000
North Central, West of Mississippi River.....	5,119,000
South Central Division.....	2,179,000
Far Western Division.....	2,266,000

Total, United States.....14,029,000

Average life of work horse.—The Horse Association of America¹ estimates as a result of its investigations that horses and

¹ Leaflet 57, Horse Association of America, Chicago, Ill.

mules on farms, going into service as three-year-olds, have an average period of service of 12 years. Horses and mules not on farms (horses used in cities and towns, and by lumber men, mine owners, contractors, etc.), going into service as six-year-olds, are estimated to remain in service for an average of 9 years. For all horses and mules that reach working age, the average duration of life is therefore 15 years. The Association also reports that the death rate in young stock "between the time they are 6 to 8 months old and the time they are 36 months old, is about 5 per cent per year, or a loss of one colt out of each twenty, in their yearling and two-year-old seasons respectively."

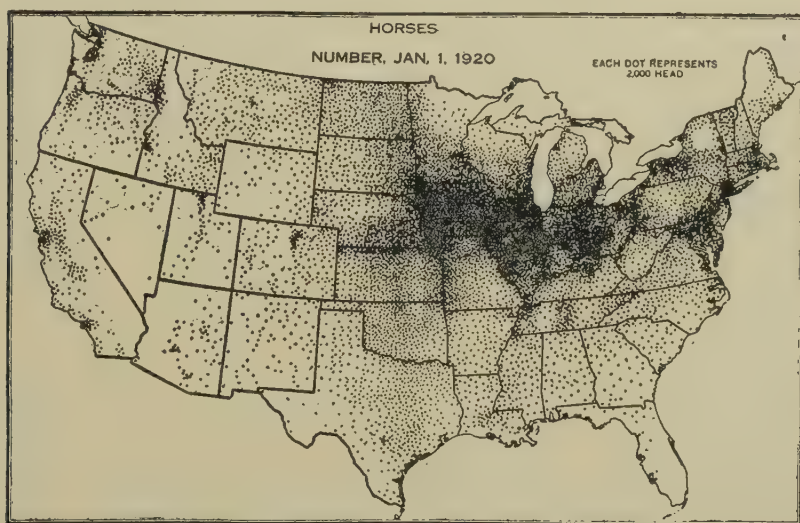


FIG. 200.—Distribution of horses two years old or over in the United States.

According to these figures, one-twelfth of working animals on farms and one-ninth of working animals not on farms must be replaced annually in order to maintain the total number of work animals in use. Replacement must come from the annual crop of foals. A number of foals are lost before 6 or 8 months of age, and 10 per cent of the remainder die before reaching three years of age. The foal crop of a given year less 10 per cent gives the probable number available at three years of age to replace losses among work animals. Applying this method to the 1920 census figures we find a probable loss of 1,911,727 work animals by death in that year, and a probable replacement from the foals of 1919 of only 1,428,764 head, leaving a deficit of 482,963 head.

The number of horses in the United States declined from 19,848,000 in 1920 to 14,029,000 in 1929, and the production of replacements continues to decline. S. R. Speelman of the U. S. Bureau of Animal Industry states¹ that approximately 500,000 horse foals and 160,000 mule foals are now being raised annually, where a million head of horses and 300,000 mules are required for replacements in order to maintain present numbers. He states that the slightly higher prices paid for both horses and mules during the last two years may tend to stimulate breeding.



FIG. 201.—Excellent type in the draft stallion. Fyvie Baron, champion Clydesdale stallion at the International, owned by Conyngham Brothers, Wilkesbarre, Pa. Note his masculinity, quality, style, correct position of legs, nice pasterns, and good feet.

Horse production on the small farm.—The advantages of intensive farming have been widely discussed for a number of years. Intensive farming is farming on a small scale, but doing it perfectly, hence realizing the largest possible return on a moderate investment. Horse production on a small scale, as discussed here, is similar to intensive farming. It means the ownership of one or two pairs of high-class brood mares, preferably purebreds, which are used to do part or all of the farm work, and which are given

¹ U. S. Dept. Agr. Yearbook, 1930, p. 331.

the very best care and attention. They are bred only to high-class stallions of the same breed as themselves, and during pregnancy they are well cared for, well fed, and not overworked. The foals are given the best of care and are carefully trained, being halter broken as early as possible and made gentle by proper handling. They are kept growing after they are weaned, and in due time are carefully and thoroughly educated in harness or under saddle, as the case may be. This is intensive horse production.

Intensive horse raising therefore means keeping a few extra-good brood mares, and each year producing a few extra-good foals which may be grown out by the breeder or sold as weanlings or yearlings to be developed by someone else. The first costs under this plan are not necessarily less than where a large number of the average kind of brood mares are kept. Good brood mares cost considerable, but they are the only kind on which large profits may be made. If this plan seems impracticable because purebred mares are expensive, why not reach the same end by buying a weanling or yearling filly of the desired breed, growing out this filly to breeding age, and retaining her best filly foals for breeding purposes? In this way, given a few years' time, it is easily possible to get on an intensive footing with as many mares as are required.

We have had enough of the average kind of horse production in this country; in fact, far too much of it. It has been demonstrated beyond all doubt that it pays much better to keep a few extra-good brood mares and raise carefully a few good foals, than it does to keep a lot of cheap mares and produce a lot of cheap horses, without feed enough to give any of them a fair chance.

The farms of the Middle West and East are well adapted to the intensive plan of horse production, because most of the farms are not large, and usually the teaming is done by the owner himself, or by one or two hands who are always under close observation. On big farms, with incompetent and everchanging help, if valuable brood mares are kept, they are liable to be injured if used to do the farm work. The plan should call for working the brood mares, but not working them as hard as geldings or mules. Let them earn their board, and board them well. They may be worked well up to foaling time if care is taken not to back them to a heavy load, or put them to a hard strain. Mares have been hurriedly unhitched and unharnessed while cultivating corn or doing some other moderate work, and have foaled thrifty, well-developed foals, the equal of any. But such mares have been well fed and cared for during

pregnancy, and they should be given as long a vacation on pasture after foaling as the farm work will permit.

The most profitable horse breeding in France, Belgium, England, Scotland, and America is done on the intensive plan, on farms of moderate or small size, by farmers who are good practical horsemen with a taste for doing things well. There is ample room in the United States for much more horse raising on this plan, and we have always had too many inferior mares, too many cheap stallions, and too many cheap horses hunting buyers.



FIG. 202.—The noted Percheron sire, Laet, champion at the 1921 International and sire of many winners. A massive, drafty type, combining size, ruggedness, masculinity, and quality. Owned by W. H. Butler, Columbus, Ohio.

Choosing a type to breed.—What type of horse shall the farmer breed? The answer depends upon how much capital is available to put into the business, upon the personal qualifications of the breeder, and also upon his personal preference as to type. To some extent, the choice will depend upon the location of the farm, and upon the crops that can be grown. It will ordinarily require more capital to engage in the breeding of light horses than in the breeding of draft horses. Light horses especially require more expensive

equipment to accomplish the training and finishing without which they sell at comparatively moderate prices. Because of temperament and disposition, some men are more successful with one type of horse than another. The man who intends to engage in the breeding of horses should ask himself the following questions regarding any or all types he may have under consideration: 1. Am I familiar enough with the type and the methods of its produc-



FIG. 203.—The Percheron stallion Jalap, owned by Iowa State College. He has a superb head, neck, and shoulder, an evenly moulded top, faultless coupling, well-placed legs, and large clean bone and joints. A very masculine type with style and quality; a highly successful sire.

tion to know what I am striving to produce and how to produce it? 2. Provided I can produce the type successfully, how can I dispose of my animals, and what are the chances of realizing full value for my stock? 3. Are my buildings, fences, land, and crops adapted to the production of horses, and if not, can I remedy the shortcomings?

Advantage of draft type.—In the majority of cases, the best type for the farmer to produce is the draft horse. It has many advantages. The brood mares are much better suited to do the work of the farm than are any of the light horse types. Practically no special training is needed to make the drafter ready for market, and he is marketable at a younger age than is ordinarily true of the types of light horses. If he is kept free from wire cuts and other blemishes, and is fat and well groomed when offered for sale, he should realize full value. The carriage horse or saddler, on the other hand, requires months of handling in order to give him a good mouth and develop his action or gaits, as the case may



FIG. 204.—A noted sire and his get. Undeclared Belgian stallion, Farceur, and eight of his get, all winners. This group includes a number of first prize winners and champions at the Panama-Pacific Exposition, International, and Iowa State Fair. All owned by William Crownover, Hudson, Iowa. Farceur was sold in 1917 to C. G. Good, Ogden, Iowa.

be. Furthermore, a wire cut or other blemish is much more serious with these types than with the drafter. They require more care and attention from birth to selling time, and require a greater age to finish them for market. It is also true that there are fewer misfits in breeding draft horses than with any other type of horse, in other words, results are more certain and sure. The production of draft horses fits into general farming better than the production of any of the light horse types. For these various reasons, the draft horse is of greatest interest to most farmers, and is most frequently selected by farmers who take up horse breeding.

Light types require greater skill.—Let it be understood, however, that the foregoing arguments are not intended to discourage the breeding of types other than the drafter. The point is that

saddle and other light horses are more difficult to produce than drafters, and but few persons, comparatively, are qualified to breed them successfully. The production of light horses requires a higher order of skill both in breeding and salesmanship than does the production of the draft horse, and when this is supplied, light horse breeding is a profitable enterprise. Hence the selection of the type to breed should be governed largely by the ability of the man who is to supervise the breeding, provided, of course, he is to work under conditions not unfavorable to the type he is best qualified to produce.



FIG. 205.—Champion Belgian stallion at the 1928 International, Lordeau 2d, owned by Charles A. Wentz and Sons, Kirby, Ohio. A big, drafty horse with style and quality. Particularly good in shoulders, arms, back, coupling, middle, and quarters.

Selecting a breed.—After the type of horse has been chosen, it is next in order to decide what breed of that type shall be selected. The choice of a breed is not so serious or important a matter as the selection of a type or the selection of the individuals which are to compose the stud. It will depend largely upon the personal fancy of the breeder, although in some types of horses in certain localities, one breed may be so much liked or another breed so much disliked as to make it advisable for the new breeder to conform to the

choice of the community, if it is possible to do so. He can then profit from the experience and advice of his neighbors, he will benefit from a greater number of local sales of his stock, and there will be more stallions to select among when mating his mares. Communities noted for the production of many good horses of a certain type or breed attract buyers from a distance.



FIG. 206.—Correct type in the draft mare. Coldham Surprise, champion Shire mare at the International, owned by George M. McCray, Fithian, Ill. Note her roomy middle, faultless top line, symmetrical form, abundant muscling, and large bone. She has size, ruggedness, and strength combined with quality and feminine character.

Selecting the individuals.—We now come to the matter of selecting the individuals which are to compose the stud. First of all, they must be sound; and this is a matter to which many farmers pay too little attention. Buyers offer the best prices for sound stock, and the farmer has too frequently sold his young mares that were sound, and has retained those with sidebones, ringbones, spavins, curbs, etc., for breeding purposes. This is radically wrong and a very short-sighted practice. Soundness is of very vital importance in every type of horse, and especially in animals used for breeding purposes. The individuals should also be true repre-

sentatives of the type to which they belong. Whether or not the brood mares should be purebred depends on the amount of capital available and on the type of horse selected. If possible, it is preferable that they be purebred, registered mares. However, some very profitable work in producing drafters for the market has been done with good grade draft mares. In such cases, these mares have shown excellent draft type, even though they were not eligible to registry. Registered purebred draft mares cost considerably more to buy, but have the very great advantage of having their foals eligible to registry, and hence of greater market value. In breeding saddle and other light horses, it is essential in most cases that purebred mares be used.

Well-developed feminine character and a good disposition are fundamental qualities in a brood mare, as such mares are usually more regular breeders, better mothers, and more easily handled and worked than are mares of masculine appearance or mean, vicious, or highly nervous disposition. The brood mare should have a long underline, and a deep, full-made, roomy middle.

Well-developed draft fillies may be bred when two years old; others should not be bred until three years old. The duration of pregnancy in mares is quite variable, but averages about 340 days. A two-year-old stallion may breed 8 or 10 mares in the season, a three-year-old from 25 to 30, and a four-year-old from 40 to 50. The breeding season lasts from 100 to 115 days, and it is important not to use the stallion too heavily at any time. A two-year-old may safely be allowed to cover one mare every five days; a three-year-old, three a week; a four-year-old, three every two days; and a mature horse should be limited usually to two covers daily, and perhaps occasionally he may make three.

A sound, purebred stallion that is true to type and a good individual in every way is the only kind worthy of patronage. If there is no such horse in the community, it will pay to ship the mares a long distance to reach such a one. If possible, it is always best to patronize a stallion that has proved himself a sure breeder and a getter of good foals. There would not be the great number of unsound, mongrel, and inferior stallions standing for public service if there did not exist a demand for them on the part of mare owners. There can be only one explanation so far as the owner of the mare is concerned, and that is the saving in the amount of the service fee; but no more short-sighted practice can be followed, it having been demonstrated in almost every community that the added value of the foal from a high-class stallion, as compared with

the foal by a cheap horse, repays the extra service fee many times over. It costs little more to raise a good foal than an inferior one, and the foal by the cheap stallion is not ordinarily a profit-maker. So many breeders have shown a lack of judgment in this matter, and horse stocks have deteriorated to such an extent in some states on account of the large number of mares bred to cheap horses, that stallion laws have been enacted which debar unsound stal-



FIG. 207.—Maplegrove Leila, champion Percheron mare at the International in 1929, 1926, and 1925, and reserve champion in 1928. Owned by Michigan State College.

lions from public service, and require that placards be posted on the stable door telling whether the stallion is a purebred, cross-bred, grade, or mongrel. Twenty-four states had stallion enrollment laws in 1929.¹

¹ The 1920 census reported that only 0.6 per cent of the total number of horses on farms on January 1, 1920, were registered purebreds. This included 94,280 registered purebred draft horses, 10,542 registered purebred light horses, and 15,718 other registered purebred horses, including ponies.

The ten leading states in numbers of registered purebred draft horses were: Iowa 13,676, Illinois 13,128, Kansas 7,391, Ohio 6,471, North Dakota 5,299, Nebraska 5,098, South Dakota 4,959, Indiana 4,491, Minnesota 4,093, and Montana 3,307.

The five leading states in numbers of registered purebred light horses were: Kentucky, 1,967, Illinois 990, Virginia 687, Missouri 532, and Kansas 477.

Results of careless breeding.—Another evil in need of remedy is the too common practice of mixing the types of horses. Heavy mares have been mated with trotting stallions in order to produce an animal for road use, or with no particular idea in the mind of the mare owner except to "get a colt." Light-weight, light-boned mares, without any semblance of draft qualities, are mated with draft stallions in the hope of getting a draft foal, or again simply



FIG. 208.—Two-year-old Percheron fillies owned by the University of Illinois.

to "get a colt." The results of such breeding are to be seen on every hand in the country, and a visit to any large horse market reveals the fact that a large percentage of the animals offered for sale are of no particular type or market class, because they have a variegated ancestry, the result of indiscriminate crossing of heavy and light horses. One is at a loss sometimes to know by what method some market offerings were produced. The result is a lot

of cheap horses adapted to no particular work, which net the producer a loss in most cases and seldom yield a profit. Breeders must learn to stick to type. The experiences of all successful horse breeders teach no other lesson more forcibly than this.

Pedigree not always an indication of merit.—In the minds of many people, the words “purebred,” “registered,” and “imported” have a charm much greater than they deserve. Far too often, glaring faults of individuality or even serious unsoundness are passed with light criticism because the animal in question is eligible to one or more of these fascinating names. After all, one must conclude that there is something in a name. It is a fact that some purebred horses are practically worthless for breeding purposes. If an animal is purebred and registered, its value is very greatly increased, provided it is a good individual of useful type; but if the animal is decidedly faulty in conformation, or has serious unsoundness, its pedigree and registration number are of small account, and the animal is of little or no value for breeding purposes.

Feed and care.—Every successful breeder is a good feeder and caretaker, for no matter how excellent the ancestry of a foal may be, its inherited good qualities cannot reveal themselves unless the foal is provided with good quarters and plenty of the right feed with which to build up and grow. Feed and care are fully as important as parentage in producing good horses.

Summary.—In conclusion, therefore, follow the intensive rather than the extensive plan of horse production; select the type to breed after careful study of the situation; select sound individuals possessing a high degree of individual excellence; breed to a strictly high-class, purebred stallion, regardless of the amount of his service fee; if there is no such stallion in the immediate neighborhood, ship the mares whatever distance is necessary to reach a high-class horse; patronize a tried and proven sire if possible, stick to a definite line of breeding—do not mix the types indiscriminately; raise a class of foals that merit plenty of good feed and care, and supply the same; be conservative in your judgment and appreciative of the fact that the breeding of horses is an enterprise which repays careful study of all departments of the business.

CHAPTER XXXVIII

THE MULE

The various breeds of the ass belong to one species known as *Equus asinus*. The various breeds of the horse belong to a distinct species known as *Equus caballus*. The male ass is called a "jack," and the female a "jennet." The cross of a jack on a mare produces a hybrid known as a "mule." The cross of a stallion on a jennet produces a hybrid known as a "hinny." Although it is often stated that the hinny and mule differ in appearance, the hinny tending to be more like a horse and the mule tending more toward the type of a jack, there is no difference in type and appearance between them. Very few hinnies are produced, as jennets are in such demand for producing jacks that they are seldom bred to stallions. Mules and hinnies do not breed, being infertile. As the saying goes, "the mule has no pride of ancestry, and no hope of posterity."

The ass has no foretop and he has a rat-like tail, flat thighs, rather flat sides, and a long middle. He lacks the full, rounding, short middle, and full thighs of the horse. He has a longer back and loin and shorter croup than the horse, and the croup is often drooping. Many are sickled in hocks and cow hocked. Light quarters and gaskins and rough hips are common.¹ The feet are smaller and narrower than those of the horse.

Breeds of jacks.—A number of breeds have been imported to the United States, including the Catalonian, Poitou, Maltese, Andalusian, Majorcan, and Italian. American breeders have made various crosses of these breeds and have developed by selection the so-called American Jack, which may be considered a distinct breed. Importations of foreign breeds are no longer made.

American breeders have selected for size, weight, bone, style, action, constitution, and finish. The present standard calls for 15.2 hands or over for jacks and 15 hands or over for jennets. Prices up to \$5,000 have been paid by American breeders for American-bred jacks. There is a strong demand for high-class jacks for both jack production and mule production.

Best type of jack.—The best jack for mule breeding is one having as much size, weight, and substance as possible, without

¹ Anderson and Hooper: American Jack Stock and Mule Production, Ky. Bul. 212.

coarseness. He should stand 16 hands or over. Very few jacks exceed 16-1 hands and 1,150 pounds. He should be lengthy and wide in form, with a straight, strong top, deep flanks, a well-shaped head, large and well-set ears, straight clean legs showing plenty of bone, large clean joints, feet of good size, shape, and texture, and a rather fine, glossy coat of hair. He should be active and show considerable style and spirit. The best color is black with light nose and belly, as a jack of this color will get the best-colored mules out of mares of all colors. Some jacks are mouse



FIG. 209.—Correct type in the jack. Limestone Monarch, a noted prize-winning jack bred and owned by L. M. Monsees, Pettis County, Mo. Height 15-3 hands, weight 1,212 pounds.

colored, and some have a mixture of chestnut and white hairs, producing a red-gray or red color. Gray is fairly common but disliked because gray jacks sire many gray mules, and gray mules become white with age and are then hard to sell.

Best mares for mule breeding.—Mares standing 15-3 to 16-1 hands, and showing some evidence of draft blood, yet having good finish and quality, produce the best mules. These mares weigh from 1,350 to 1,500 pounds. The mare should have a roomy middle and she should also have large, wide, and good feet.

Hooper and Anderson of the Kentucky Experiment Station¹ state: "It is generally recognized that in the cross of the ass and the mare the coarser qualities of the ass are dominant over the finer qualities of the mare; that is, the distinctive features of the ass are to be found in the mule. These appear in the head, ears, mane, legs, tail, and feet. The mares in most cases are able to modify these distinctive characteristics but not to suppress them. For example, the foot of the ass is contracted, and needs to be widened in the mule. * * * The body of the jack has a tendency to narrowness and angularity. The big, round, smooth brood mares will add as their complement, size and smoothness to the mule."

The mule.—Big, heavy mules bring the highest price if they show smoothness and good quality. The very best stand 16-3 to 17-2 hands and weigh 1,600 to 1,700 pounds. Few reach 1,800 pounds. Mules do not weigh as heavy for their height as horses. Mules are judged by practically the same standards as horses.

The mule and horse compared.—Mules are more sure-footed than horses, pick their way more carefully, and look out for themselves better than a horse. Mules are more intelligent than horses, and are more apt to learn to refuse or avoid hard or unpleasant work. When a mule gets tangled up in wire or into some other predicament, he usually stands quietly until released, whereas a horse often becomes excited and struggles even though he lacerates his legs and body and punishes himself very severely. Working in shallow passageways in mines, the small mules used in such work are said to lower their heads when their ears touch the top of the tunnel, while ponies under similar conditions throw their heads upward and may injure themselves. Mules usually accept their lot and plod along at their work without wasting energy in fretting or nervousness, while worry rather than work often keeps a horse thin. Mules are less sensitive than horses; they accept more abuse and rough handling, and get along better under an incompetent driver. Mules stand hot weather better than horses. Mules are less subject to digestive troubles and founder. A mule will not gorge himself as a horse often does if he gets into the feed bin or has access to too much feed. The mule's foot has a very thick, strong wall and sole which enables the foot to endure the shock and concussion on hard pavements particularly well. Mules are less subject to foot troubles which cause lameness, and their feet are less affected by continuous shoeing. Mules are usually stabled more cheaply than horses. They are often kept in sheds or

¹ Ky. Bul. 176, p. 394.

pens in which a number are turned loose together. Aged and second-hand mules sell better than aged and second-hand horses. Mules require less veterinary attention and are less often incapacitated for work than horses. Mules once worked together as a team are harder to separate than horses. This may be an advantage, or it may in some cases prove a detriment. Mules are more uniform in form and color than horses, and are easier to match into teams.

Anderson and Hooper state:¹ "The mule holds his place and is gradually extending his influence as a work animal because he can do more work, on less feed, and keep in better condition, with less care, than any breed of horses. He stands the heat well in the South, resists the flies as the horse cannot, and fits in with the farm labor of that section much better than any horse."

Sir John Moore, Director of the British Army Veterinary Services in France, states² that 80,524 mules were purchased by the British government during the South African War, and he estimates that over 250,000 were purchased for the World War, including over 90,000 used in France alone. He further states: "As a rider, a mule is of little value; a supreme will and an iron mouth, as a rule, prove the drawback. * * * Their endurance, their comparative freedom from sickness, their pluck and stout-heartedness when properly treated, their ability to perform work in adverse circumstances and when short commons are necessitated, are their usual attributes; and their employment in war is a great economic factor." He states that the well-fed mule thrives on work and quickly gets fat when idle. He states also that in the Somme operations in 1916, there were 16,074 debility (poor condition) cases sent to the veterinary hospitals, of which only 404 were mules. The percentage of inefficiency was 4.42 for horses and 0.61 for mules, or seven times as many horses as mules in comparison to numbers in service. In winter they gave far less trouble than horses from skin disease, and there were practically no cases of respiratory disease among the mules.

An editorial writer in the Chicago Evening Post³ states that though tanks, tractors, airplanes, etc., have displaced time-honored material of warfare, "the army mule stands fast in his tracks." He says, "The mule will go on serving until the end of time and will continue to do little more than to flick an ear when in its awful

¹ Ky. Bul. 212, p. 287.

² N. S. Mayo, Cook Co., Ill., in the Breeder's Gazette, Nov. 23, 1922.

³ Quoted in the Breeder's Gazette, Apr. 5, 1923, p. 472.

hollow there sounds the equally awful language of teamster tradition. The American army has sworn at the American mule for much more than a century of time, but it swears by him as often as it swears at him." Again he says, "The mule is the only muzzle-loader likely to survive the mutations of time."

On the other hand, the mule has some shortcomings as compared to the horse. He has not the weight for the heaviest draft work. Because of the small size of his foot he is more apt to slip on pavements at a hard pull. Furthermore, the mule's habit of



FIG. 210.—Prize-winning mules. Champion pair of mules at the Iowa State Fair, owned by F. L. Hutson and Son, State Center, Iowa. These mules were six years old and weighed 1,600 and 1,620 pounds. The off mule (on the left of the picture) was the champion single mule of the show.

pushing directly forward against the collar, instead of crouching and lifting like a draft horse at a hard pull, also results in slipping on pavements. Mules do not work well in soft ground. The small foot of the mule does not bear him up, and he is usually much more timid under these conditions than is the horse. Mules will avoid a muddy spot or puddle of water if they can. The wilfulness and trickiness of many mules and their lack of spirit makes it less of a pleasure to drive the average mule than the average horse. The mule has a harder mouth. Too often it takes a gag bit to

hold him and a black-snake whip to make him go. Mules are not adapted to use in the artillery, as they are gun-shy, usually lack speed, and do not respond to commands quick enough. They are not so dependable as horses in an emergency.

George E. Wentworth, superintendent of the Chicago Union Stock Yards Horse Market, in an interesting article¹ entitled "Why Use Adulterated Horses?" discusses the place of the mule in warfare as follows: "They say the mule can stand more heat, but



FIG. 211.—High-class draft mules at the Union Stock Yards, Chicago.

cavalry regiments in South America, South Africa, Arabia, India, China, or Morocco are not mounted upon the sure-footed, swift, enduring, and patient mule. The Cossacks did not pursue Napoleon from Moscow on the backs of mules, nor did the men of Marion and Sumpter, Stuart or Sheridan win their victories astride the progeny of a jack. The Crusaders panoplied in full armor, fought Saladin and his Emirs over the dry and arid dusty deserts of Palestine

¹ The Horseman and Spirit of the Times, Aug. 4, 1914.

mounted upon Norman and Arabian horses. Armies trust live weight to horses, dead weight to mules."

As mules do not breed, there is no opportunity for profit to the farmer from this source. The mule's inability to breed is something of an advantage in the city and in the army, as there is always the danger of a mare being in foal when she is purchased, and if she is it causes trouble and annoyance in a city stable or in the army; she must either be sold or kept idle for a time. From all standpoints, however, the mule's failure to breed is a detriment as compared to the horse.

The distribution of mules in the United States is shown by the numbers on farms in the ten leading states and in the different geographical divisions on January 1, 1929, as estimated by the U. S. Department of Agriculture:

Leading states in numbers of mules on farms, January 1, 1929

State	Number	Average value	State	Number	Average value
1. Texas	1,021,000	\$71	6. Alabama	327,000	\$95
2. Georgia	347,000	109	7. Tennessee	321,000	80
3. Arkansas	339,000	65	8. Missouri	313,000	75
4. Mississippi	336,000	85	9. Kentucky	292,000	69
5. Oklahoma	333,000	58	10. North Carolina..	276,000	124

Distribution of mules on farms by geographical divisions, January 1, 1929

Division	Number
North Atlantic Division.....	62,000
South Atlantic Division.....	993,000
North Central, East of Mississippi River.....	291,000
North Central, West of Mississippi River.....	756,000
South Central Division.....	3,136,000
Far Western Division.....	204,000

Total, United States.....5,447,000

The South Atlantic and South Central states, extending from the western border of Texas to the Atlantic coast, have over 75 per cent of all the mules in the United States.

No mules were reported on farms on January 1, 1929, in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. The 1920 census found only 2,367 mules two years old or over in these six states, including those in use on farms and in cities and villages.

More mules than horses were reported in 1929 in North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and Texas. Georgia has nine times as many mules as horses.

The average value of mules on farms in the United States in 1930 is reported at \$83.00, and the average valuation of horses on

farms is reported at \$70.71. In only five states are horses reported at a higher average value than mules. These are New York, Ohio, West Virginia, Michigan, and Wisconsin.

The average value of mules varies widely in different states, due principally to differences in the average age of the animals. Low average values are usually due to proportionately large numbers of mule foals and yearlings.

Countries having the largest numbers of mules are United States 5,547,000, Spain 1,295,000, Argentina 611,000, Italy 497,000, Colombia 201,000, France 181,000, Mexico 133,000, and South Africa 95,000. Spain and Peru have more mules than horses.

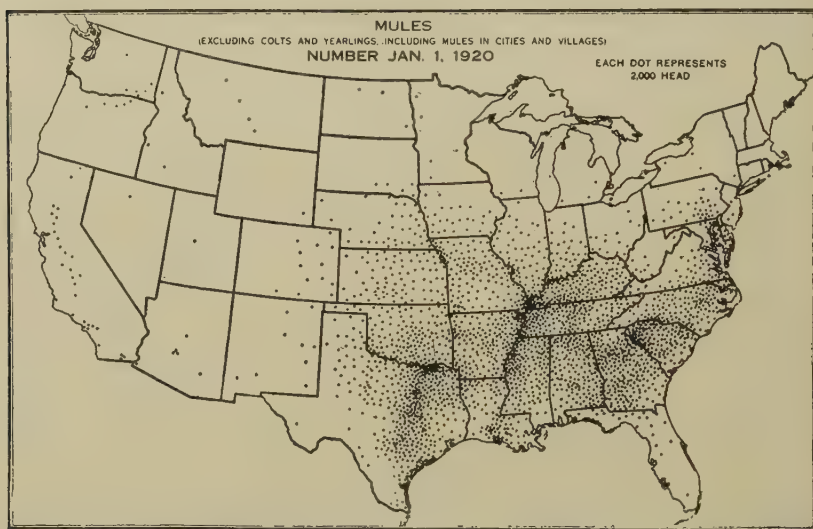


FIG. 212.—Distribution of mules two years old or over in the United States.

Production of mules in the United States.—O. E. Baker of the U. S. Bureau of Agricultural Economics states that two-thirds of the mules produced in the United States are raised in the western and southern sections of the corn belt, and that the center of mule production is about 300 miles south of the center of horse production. He also states that whereas the number of horses over one year of age on farms in the United States increased only 6 per cent from 1910 to 1920, the number of mules increased 33 per cent, and this rate of increase was almost as great in the North as in the South.¹ It may be added that while horses on farms in

¹ A Graphic Summary of American Agriculture, U. S. Dept. Agr. Year-book, 1921, pp. 471, 473.

the United States declined 29 per cent. from 1920 to 1929, mules on farms declined only 0.5 per cent.

Assuming that the average life of mules is about 15 years, there will be a loss each year of 1 out of every 13 mules two years old or over. Replacements are made from the mule foals raised each year. States which have 1 mule foal on January 1 to every 13 mules two years old or over (a ratio of 1:13) probably produce sufficient foals to maintain their present number of mules.² States which produce less than this proportion of mule foals must buy from other states in order to replace losses among working mules. States which produce more than this proportion will have a surplus for sale. Note the ratios in the following table of leading mule-using states, based on census returns:

Mules two years old and over on farms in leading states, January 1, 1920

State	Twos and over	Foals	Ratio (Number of twos and over to one foal)
1. Texas	774,517	35,299	22.1
2. Georgia	399,801	2,141	186.7
3. Arkansas	292,658	14,625	20.0
4. Mississippi	288,971	10,052	28.9
5. Tennessee	287,939	33,217	8.7 ¹
6. Alabama	285,838	4,533	63.1
7. Oklahoma	265,133	35,299	7.6 ¹
8. Missouri	255,455	68,457	3.7 ¹
9. North Carolina	246,212	3,435	71.7
10. Kentucky	245,717	23,450	10.7 ¹
11. South Carolina	215,712	1,040	207.4
12. Louisiana	172,847	3,272	52.7

¹ Mule-surplus states.

In comparison with the above, note the ratios in the leading mule-producing states:

Mule foals on farms in leading states, January 1, 1920

State	Foals	Twos and over	Ratio (Number of twos and over to one foal)
1. Missouri	68,457	255,455	3.7 ¹
2. Kansas	45,036	157,402	3.5 ¹
3. Oklahoma	35,854	265,133	7.6 ¹
4. Texas	35,299	774,517	22.1
5. Tennessee	33,217	287,939	8.7 ¹
6. Illinois	29,224	113,271	3.9 ¹
7. Kentucky	23,450	245,717	10.7 ¹
8. Iowa	16,819	51,205	3.0 ¹
9. Nebraska	15,782	69,643	4.4 ¹
10. Arkansas	14,625	292,658	20.0
11. Indiana	14,509	72,162	5.0 ¹
United States	389,279	4,651,694	12.0

¹ Mule-surplus states.

² The census of 1920 reports a ratio of 1:12 for the country as a whole, and this provides an increase in the number of mules in the United States.

CHAPTER XXXIX

MARKET CLASSES OF MULES

The mule market is of more recent origin than the horse market, but has developed into a large business. Whereas horses are usually sold at auction, mules are usually sold at private sale, being sold singly, in pairs, or in any number to suit the needs of the buyer. When large numbers are wanted of a uniform height and weight, they are most often sold at a fixed price per head and the salesman gives a guarantee as to age, soundness, and other requirements. When an order is placed for mules of different sizes or for different market classes, they will ordinarily be figured individually, or in pairs.

Market requirements.—The market requirements for mules are similar to those for horses. They should be sound, of a desirable age and color, well fleshed, and sleek in coat; and should possess abundant quality and a strong conformation. They should also have good action. These requirements are discussed in detail below.

Soundness.—Mules should be serviceably sound. Blemishes are objectionable, though not in the same degree as with horses. They should be sound in eyes and wind, and should be good workers. The most common and serious unsoundnesses are large spavins, puffs, sidebones, defective eyes, and unsound wind.

Age.—The most desired age is from four to eight years; however, there are exceptions in some classes, as noted below.

Condition.—The appearance is greatly improved if mules are marketed carrying flesh enough to round out their middles. Sleek, glossy coats of hair are often estimated to be worth ten dollars. The flesh should be smooth, not lumpy or roly. The value of flesh on mules is about equal to that on draft horses—which is twenty-five cents per pound with a good grade of horses.

Quality.—Refinement of head, hair, bone, joints, and hoofs is an evidence of good bone and wearing qualities.

Conformation.—All mules should have a large chest, long shoulder, deep barrel, straight short back with as much spring of rib as possible, a broad loin, and a long level croup. The underline should be comparatively straight, the rear flank well let down, and the thighs and quarters heavily muscled. The legs should evi-

dence both substance and quality, the feet should be large, wide at the heel, and sound, and the hoofs should be smooth. The form, muscling, and set of legs should be approximately the same as in horses. The head of the mule is a good index of his disposition and temperament; it should be of good size, yet clean-cut as an evidence of quality. The forehead should be broad and flat, and the nose slightly Roman, which indicates stamina and strength. If the head is as described, the animal is usually considered to be a more reliable and agreeable worker than one not possessing these characteristics. The ears should be long, thin, tapering, and



FIG. 213.—Mining or pack mule.

carried erect; the neck should be long, with moderate crest, and should join the shoulder smoothly. The mane should be roached, and the tail clipped in the regular manner with not too short a bush.

Color.—All mules of solid color, except white and dun, are in good demand, though color is not an important factor. Dapple grays are popular in the draft class, but as a general rule, bays, browns, blacks, and chestnuts are most desirable, while flea-bitten grays are discriminated against.

Action counts for very little in market mules. They should show vigor and energy in their movements and be straight-line movers. They should not be lame or crampy, nor defective in action because of badly set legs.

The market classification of mules is based on the uses to which they are put, but in order for a class to exist there must be a demand for considerable numbers of a definite type. In the St. Louis market, which is the largest mule market in the world, there are six market classes which are as follows:

Class	Height Hands	Weight Pounds
MINING MULES.....	12 to 16	600 to 1,350
COTTON MULES.....	13-2 to 15-2	750 to 1,100
SUGAR MULES.....	16 to 17	1,150 to 1,300
FARM MULES.....	15-2 to 16	900 to 1,250
DRAFT MULES.....	16 to 17-2	1,200 to 1,600
ARMY MULES....	{ Wheel mules.....15-3 to 16-1	1,150 to 1,300
	{ Lead mules.....15 to 15-3	1,000 to 1,150
	{ Pack and riding mules..14-2 to 15-2	950 to 1,200



FIG. 214.—Cotton or lead mule.

Mining mules are purchased for use in mines, principally to haul cars of ore or coal to the hoisting shafts. They are rugged, deep bodied, short legged, compactly built, and have heavy bone and large feet. They stand from 12 to 16 hands high, and weigh from 600 to 1,350 pounds. Those used down in mines are termed "pit mules," and the height of these is limited by the depth of the vein worked. Small pit mules are produced from pony dams. Ages from 5 to 8 years are most preferred, but a well-developed four-

year-old, or a well-preserved ten-year-old, is often accepted. Geldings are much preferred to mare mules for this trade because they are usually more gentle than mare mules. Mine mules must be gentle and not ticklish about the ears and feet. Bad wire marks on the feet are severely discriminated against, as they are likely to become sore from contact with sulphur and other chemicals in the mine. The demand for miners is strong and constant throughout the year, and comes from all sections where mines are operated.

Cotton mules are very similar to mining mules in size, but are lighter boned and not so compactly built. They should have small, neat heads, and possess much quality and finish. Their feet are smaller and bodies proportionately lighter. Cotton mules stand

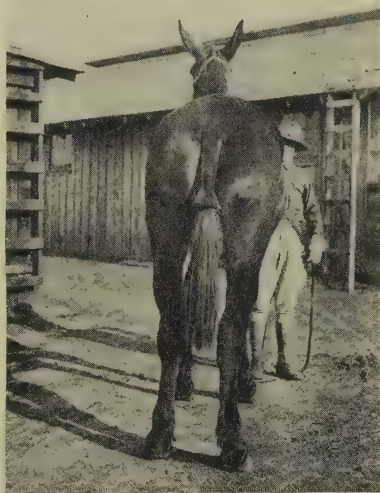


FIG. 215.—Sugar mule.

from 13-2 to 15-2 hands high, and weigh from 750 to 1,100 pounds. They are most desired from 3 to 7 years old, but may find ready sale up to 12 years of age. Mare mules sell better than geldings in this class. The trade begins about the first of September and continues good throughout the fall and winter months, then gradually decreases until after the cotton crop is planted, or about April. From this time until the following fall, the demand is light. Cotton mules are used by cotton growers to plant, cultivate, and harvest the cotton crop, but a great many such mules are also taken to cities for use on delivery wagons and for other purposes.

Sugar mules are mules especially adapted for use on the sugar farms of Georgia, Louisiana, and other southern states. Sugar

mules are taller, larger, more breedy looking, better finished, and have heavier bone than cotton mules. The feet should be large in proportion to the bone. They stand from 16 to 17 hands high, and weigh from 1,150 to 1,300 pounds. Mare mules from 3 to 6 years old are most desired for this trade. As sugar mules are larger and possess more quality and finish than cotton mules, they sell for a little more money. The trade begins in August, and usually ends in February. They are in greatest demand in September, October, and November.



FIG. 216.—Farm or wheel mule.

Farm mules are those purchased for use on farms in the central states. They are less uniform in type than the other classes, as farmers like to buy animals that show promise of further development. Farm mules are usually from 15-2 to 16 hands high, and from 3 to 6 years old, four-year-olds being preferred. They are often plain looking and thin in flesh, though possessing good constitution, bone, and feet, and showing indications of a good outcome when well fed and cared for. Many of them are worked for a time, then fattened and returned to the market. When resold they may be taken as miners, sugar mules, or cotton mules. The strongest demand for farm mules occurs during the late winter and spring months.

Draft mules are large, heavy-boned, heavy-set mules, with plenty of quality. They are purchased to do heavy teaming work. Many are used by contractors doing railroad grading, and con-

sequently they are often spoken of as railroad mules. They are especially demanded for heavy teaming work in cities in warm climates, where they are preferred to horses because they are said to be hardier, able to stand the hot sun better, and not subject to as many ills. Draft mules stand from 16 to 17-2 hands high, and weigh from 1,200 to 1,600 pounds and upwards. They should combine weight and strength. They should be large, rugged, heavily boned, and strongly muscled. The feet should be large, the back short and strong, the middle deep and closely coupled, the croup fairly level, and the thighs and quarters massive. They are most desired from 5 to 8 years old, and little preference is shown regarding sex. The demand is strong and quite constant the year round. (See Fig. 211.)

Army mules.—The demand for mules in the army is very limited and the class is not important except in time of war. In the recent World War, the American mule played a very important part, and large numbers were purchased at the various markets. Three classes are required, these being wheel mules and lead mules used in four-in-hand teams on army wagons for transport work, and pack and riding mules.



FIG. 217.—Small pair of wheel mules to army wagon.

Wheel mules.—Government specifications call for mules that are "sound, well bred, and of a superior class; of a kind disposition, free from vicious habits, gentle, and well broken to harness, with free and springy action at the walk and trot; and otherwise to conform to the following description: A mare or gelding of uniform and hardy color, in good condition, from 3 to 8 years old. Three-year-old mules will be purchased only when exceptionally fine in-

dividuals." Wheel mules stand 15-3 to 16-1 hands high, and weigh from 1,150 to 1,300 pounds.

Lead mules are of the same general description as the wheelers, but are smaller animals. They should stand 15 to 15-3 hands high, and weigh from 1,000 to 1,150 pounds.

Pack and riding mules stand from 14-2 to 15-2 hands, and weigh from 950 to 1,200 pounds. They must be of stocky build, with a stout neck, short, strong back, good coupling, large deep barrel, and good feet and legs, with ample bone. The pack mules must be particularly deep in the middle and strong backed, as they carry a long pack saddle which fits well down on the sides of the mule, and they carry from 300 to 350 pounds. Pack mules are used for transport work in very rough or wooded country where wagons cannot be used. The demand for these mules is limited.

Plugs are worn out, cheap mules that have but little value. They are usually unsound in one or more respects, very plain and rough in form, and many are of advanced age.

Export mules.—The export trade in mules has increased during recent years. Large shipments have been made to South Africa, Philippine Islands, and Cuba. The size and type of these mules varies, depending on the use to which they are put and the country to which they are sent. Some are used for army service, some for agricultural purposes, some for heavy teaming, and some in mines. Hence the term "export mule" is a trade name which is not restricted to any particular kind of mules.

CHAPTER XL

UN SOUNDNESS IN THE HORSE

Soundness is a very vital factor in determining the value of a horse, and a knowledge of unsoundness is very essential to success in breeding. Brief description of the most common unsoundnesses has been deferred until the close of the discussion of horses in order that the student may learn to fix his attention, first of all, on type. The matter of soundness, while important, is often overemphasized by beginners. Presented here at the close, such information should serve as an important supplement to preceding discussions of the types and market classes of horses and mules.

If a horse is unsound, his unsoundness may be accounted for in one or more ways: (1) he may have had a natural weakness in conformation or structure which predisposed him to the unsoundness; (2) he may have been strong in conformation, but forced to do extreme labor which was beyond the power of the animal machine to endure; (3) the unsoundness may be the result of a bruise, blow, cut, or other injury; (4) unsoundness may result following a diseased condition of some part of the body, and (5) lack of proper care, as, for example, failure to keep the feet in proper balance so as to distribute the weight and wear equally over the various parts of the foot and leg, may bring on unsoundness. In the horse for work, it matters little which of the above explanations applies; he is unsound, and the horse market fixes his value according to the nature of the unsoundness, without regard to the reason why the horse has it. In the horse intended for breeding purposes only, unsoundness should not be considered a serious detriment unless it is explained by the first of the possibilities listed above. For example, it is wiser to breed to a horse having a naturally strong hock which, because of accident or extreme work, has developed a bone spavin, than it is to breed to a sound horse having a weakly formed hock which is free from bone spavin only because it has never been put to the test of even moderate work. It is often difficult, however, to determine with accuracy the reason for an unsoundness, and in all such doubtful cases the unsoundness should be looked upon with suspicion and the horse rejected for breeding purposes.

Certain unsoundnesses are ordinarily referred to as "hereditary," on account of their marked tendency to reappear in succeeding generations. More correctly, however, it is some weakness of conformation that is transmitted which predisposes the members of the family to one or more unsoundnesses. Considerable difference of opinion exists among well-informed persons as to the hereditary transmission of some unsoundness.

A number of minor troubles which are not unsoundnesses are here given brief mention, because of the frequency with which they are met and to satisfy curiosity regarding them. Treatment is briefly mentioned in some cases for a similar reason. Many minor troubles are important because they blemish a horse. A blemish merely detracts from the appearance of the animal whereas an unsoundness interferes with his working capacity. Many unsoundnesses are blemishes as well. A study of the ills to which the horse is heir shows that his eyes, legs, and wind are the seats of unsoundness.

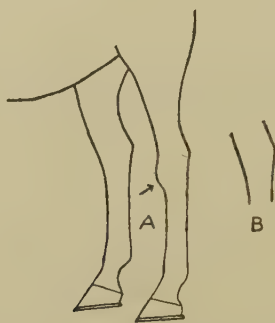


FIG. 218.—Bog spavin. A, Bog spavin; B, sound hock.

Blindness.—Any defect of sight is a serious defect in a horse, and eye trouble always furnishes grounds for rejecting horses for unsoundness. Inspecting a horse for blindness requires expert knowledge of the diseases of the eye, and, although the average horseman can in many cases discover defective eyes, no horse is safely passed as sound in eyes except by a well-qualified veterinarian. Severe weeping, partially closed eyelids, sunken eyes, inability to bear strong light, a cloudy appearance of the cornea, unnatural or dull color, failure of the iris to contract to a considerable degree when brought from darkness to light, too active play of the ears, failure to blink when an object is passed close to the eye—these and many other conditions give evidence of defective vision. (See also **cataract** and **periodic ophthalmia**.)

Blood spavin is situated in front and to the inside of the hock, and is merely a varicose or dilated condition of the vein passing over that region. It occurs directly over the point where the bog spavin is found, and is sometimes confused with the latter. It constitutes a blemish rather than an unsoundness.

Bog spavin is a round, smooth, well-defined swelling in front and a little inward of the hock. On pressure it disappears to reappear on the outside and just behind the hock. It is caused by a weakness in the synovial sacs of the joint, accompanied by a hyper-secretion of synovial fluid or joint oil. Bog spavins are more often blemishes, rather than unsoundnesses. They are classed as the latter only when they are well developed or cause lameness. Slight cases are described as merely "a little full in the hocks." Treatment consists of rest, blistering, cauterization, and the use of pressure pads and peculiar bandages.

Bone spavin is a bony growth of variable size in the hock, which may or may not make itself visible on the exterior. It most often

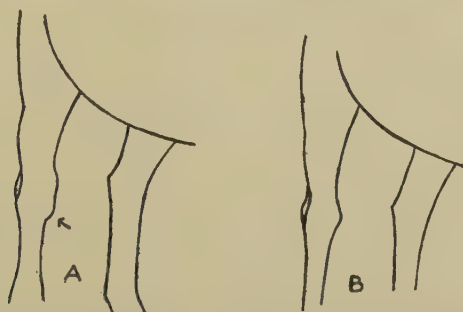


FIG. 219.—Bone spavin. A, Bone spavin; B, sound hock.

occurs at the inner and lower border of the hock, but may arise on the upper part, or on the outside of the hock. In some cases, no outward signs of spavin are perceptible; these are called "occult" spavins. Care should be taken not to mistake a prominent development of the inner and lower border of the hock, natural in some animals, for a spavin. Hocks that are narrow or tied in below are subject to bone spavin, as are also those of coarse structure.

Bone spavins affect one or more of the six bones of the hock. The spavin usually represents an effort on the part of nature to repair the joint. Spavins are caused by sprains, by violent efforts in jumping, galloping, trotting, or pulling, by slipping or sliding, and other similar causes. This is classed as an hereditary unsoundness. It is one of the most serious unsoundnesses of horses;

It causes lameness and stiffens the joint. As with sidebones and ringbones, the size of the spavin is not a safe index of its seriousness. An excellent test for spavin lameness consists in lifting the affected leg off the ground for one or two minutes, holding the foot high so as to flex all the joints. Then start the animal off in a trot, when the lameness will be greatly intensified if it is caused by spavin. Treatment consists of complete rest for a month or more, blistering, the use of proper medicaments, firing, and special operations on the joint. Firing produces a small scar, and when this is present the spavin is called a "jack."

Broken wind or heaves is denoted by a characteristic hollow cough, short, and something like a grunt, which once heard is easily recognized a second time. Inspiration is performed normally, but expiration is abnormal, being double, or what is commonly called the "double lift." The first portion of the expiration expels the air as normally, and the second apparently squeezes the remainder of the air from the lungs in a gradual manner, seemingly with more or less voluntary exertion. When such an animal is put to work, there is also a wheezing noise with the breathing. From a commercial standpoint, a broken-winded horse has practically no value, yet he may continue to work fairly well. The cough is sometimes disguised by unprincipled persons through the administration of such substances as shot and grease; but this is only temporary. The abnormal breathing cannot be concealed. In some cases of broken wind, the air vesicles of the lungs have been found, after death, ruptured; the right side of the heart enlarged, and the walls of the stomach dilated, though this is not always true. A predisposition to this disease may be inherited. In doubtful cases of broken wind, give the animal all the water he will drink and then ride or drive him uphill. This will bring out the symptoms if the disease is present.

There is great diversity of opinion as regards the exact cause of heaves. It is usually associated with disorder of digestion, or to an error in choice of feed. Feeding on clover hay or damaged hay or straw, too bulky feed, and keeping the horse in a dusty atmosphere or a badly ventilated stable produce or predispose to heaves. Horses brought from a high to a low altitude are predisposed.

Capped elbow is commonly termed "shoe boil," and consists of a bruise at the point of the elbow, generally caused by the heel of the shoe when the horse is lying down, and sometimes from other causes. The continued irritation leads to the production of a tumor at the point of the elbow. The skin may be broken, and

slight suppuration very often occurs. The cause must be removed, and the animal provided with a leather or rubber ring around the fetlock while in the stall. The remainder of the treatment is surgical. Capped elbow may cause severe lameness, but it is usually a blemish only.

Capped hock is quite common and may or may not constitute unsoundness. It is the result of a bruise, either continuous or intermittent, and may appear suddenly or gradually. Such bruises may be received in shipping by train or boat, or by the habit some animals have of kicking against the sides of the stall, or at fences, or even in harness. The skin, bursa, or the bone may be involved in capped hock. Usually it is the skin, which becomes very much thickened over the point of the hock. It is in every case a blemish. Treatment consists of hot and cold applications and blistering.

Cataract.—When the lens of the eye becomes so cloudy or opaque as to present a white or grayish color, the eye is said to be affected with cataract, which is a practically incurable form of blindness. A blow over the eye and other causes bring it on. It is rather common, particularly in aged horses.

Chronic cough.—A permanent cough accompanying broken wind, glanders, and other diseases constitutes an unsoundness.

Cocked ankles or knuckling is a partial dislocation of the fetlock joint, in which the position of the bones is changed, the pastern becoming more nearly perpendicular. While it is not always an unsoundness, it nevertheless predisposes to stumbling and to fracture of the pastern. Young foals are frequently subject to this condition, and in the great majority of such cases the trouble disappears in a few weeks without treatment. Horses with erect pasterns often knuckle as they grow old, especially in the hind legs. All kinds of hard work, particularly in hilly districts, are exciting causes of this trouble. It is also caused by improper shoeing, in which the toe is made too long and the heel too low, thus producing inflammation and retraction of the tendons. Lastly, it is caused by disease of the suspensory ligament or of the flexor tendons, whereby they are shortened, and by disease of the fetlock joint. It is one of the worst faults a horse can possess, and it greatly affects the value and the price. Treatment varies depending on the cause of the trouble. Relief may be secured by so shoeing as to shorten the toe and elevate the heels, thus relieving the tendons. In extreme cases, the tendons may be operated on to secure relief. Firing and blistering effect a cure in some instances. (See Fig. 221.)

Contracted feet.—Contraction of the feet is not a diseased condition in itself, but is a symptom of such and leads to trouble. Contraction is due to a removal of the full functions of the foot, such as is the case in lameness, removal of frog pressure, defective shoeing, etc. Contraction occurs more especially at the heels, and more frequently in the fore feet than in the hind ones. Veterinarians look upon this condition as constituting unsoundness. Treatment is not of much avail, but going barefoot or wearing a special shoe to spread the heels will help to alleviate the condition.

Corns.—A corn is a bruise to the fleshy sole, and is manifested by a reddish discoloration of the horny sole beneath the bruise. It usually occurs upon the inner quarter of the fore foot. A corn very often causes severe lameness, and is a cause of unsoundness. The treatment consists in paring, special shoeing, poulticing, keeping the part thoroughly clean, and a few weeks' rest.

Cracked heels.—This condition is denoted by an inflamed state of the skin, which becomes broken, and, if severe, may cause

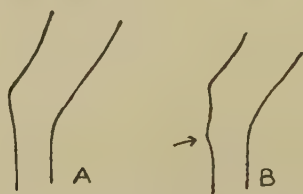


FIG. 220.—Curb. A, Sound hock; B, curb.

lameness. They are frequent in the horse, especially following a frost, the moisture from the thaw favoring this. It is similar to chapped hands, and fissuring is favored by the movements in the hollow of the heels. Treatment consists of the application of a soothing liniment applied daily with tow and bandage.

Curb is an unnatural prominence of variable size, located on the posterior border of the hock, four or five inches below the point of the hock. It is easily detected by viewing the joint in profile. It is caused by a sprain of the tendon which passes over that part, or of the strong ligament located there. Hocks that are sickled, coarse, and thick in appearance, or that are too narrow from front to back at their base, most often develop curbs. Violent efforts in heavy pulling, high jumping, or slipping are often the direct cause of curb. Curbs do not often cause lameness, or, if they do, it is usually during the formative stage. Legally it is an unsoundness, although it is not much of a detriment, especially in horses for slow work. Curbs are much less serious than bone

spavins, ringbones, sidebones, cocked ankles, and stringhalt. Treatment in the early stages consists of cold applications to relieve the acute inflammation. When the first stage has passed, blistering, frictions with ointments, and firing are often used with good success.

Fistula is an ulcerous lesion found at the withers. Fistulas follow as a result of abscesses, bruises, wounds, or long-continued irritation by the harness or saddle. The pus burrows and finds lodgment deep down between the muscles. The horse becomes incapacitated for work for a considerable period. Most cases are curable. The treatment is largely surgical; the animal should be placed in the care of a competent veterinarian as soon as the condition is discovered. After the fistula is healed, a scar usually remains in the region of the withers. A horse that has had fistula is liable to subsequent attacks of the same trouble.

Founder or laminitis is a simple inflammation of the fleshy laminæ within the hoof. Being exceedingly vascular, the laminæ are subject to congestion, and, being enclosed within the hoof, there is very little room for the relief of the congestion. The animal suffers most agonizing pain. Concussion is one of the most common causes. Another is over-feeding on grain, causing indigestion, irritation of the alimentary tract, and inflammation of the fleshy laminæ through sympathy. Other causes are unusual excitement, bad shoeing, over-exertion, exhaustion, rapid changes of temperature, or any other agencies of an over-supply of blood to the fleshy laminæ, resulting in congestion and inflammation. But it is the after-effects which are of most interest to us here. The disease sometimes becomes chronic, and this seriously affects the secretion of the horn. The toe of the hoof turns up, the heels become longer than natural, while the hoof near the coronet is circled with ridges like those of a ram's horn. These ridges are wide apart at the heel, and close together in front, and are due to periods of interference with the growth of horn simultaneous with the inflammation of the fleshy laminæ. Because of the high heel and turned-up toe, the leg knuckles at the fetlock joint. Usually, accompanying these defects, the sole is found to be thin, convex, and weak, and will stand but little wear. Because of the convexity, the diseased tissues bear unusual weight, and such animals are generally incurable cripples.

Grease is not an unsoundness, but is such a troublesome and common complaint that brief mention is here given. It is a skin disease appearing nearly always in the hind canons. Draft horses

are more subject to it than light horses. Some individuals are predisposed to it—those with coarse skin and coarse feather. Other horses have it as a form of parasitic mange, denoted by a greasy condition of the skin, congestion of the skin, erect hair, and offensive odor due to discharge from the sores. There is a constant itching and the horse rubs the part, producing thickening and wrinkling of the skin. Treatment varies. Half an ounce of Fowler's solution of arsenic night and morning in the feed, burning with hot iron, applying hot linseed poultices, dressing with lead lotion, giving a mild physic, decreasing amount of feed allowance—all these furnish good methods of treatment.

Hip down is a fracture of the point of the hip, often caused by the animal striking the part against the door posts of the stable. It causes a flatness and sometimes the broken piece of bone may be felt. It is best detected by standing squarely behind the animal and viewing it across the hips. It constitutes a blemish.

Navicular disease is a chronic inflammation involving the navicular bone, the navicular bursa, and the flexor tendon of the foot. It is brought on by repeated bruising. Light horses are affected much oftener than heavy horses. The hind feet are seldom affected. It is practically never found in mules. One-third of the weight falling on the leg is sustained by the little bow-shaped navicular bone, and the bone in turn is supported by the flexor tendon of the foot. (See Fig. 160.) Such defects as an insufficient plantar cushion, a small frog, and contracted feet predispose the horse to navicular disease. In this way the disease may be hereditary, as these predisposing causes may be transmitted to offspring. High knee action, fast work, and hard pavements also endanger a horse from this disease. Dry stables, heavy pulling, and bad shoeing also tend toward the development of this trouble. In the early stages of navicular disease, the animal at rest points the affected foot forward and rests it on the toe, with the fetlock and knee flexed. In the lameness which develops, the affected leg takes a short stride, and the toe strikes the ground first. The disease is progressive and incurable, rendering the animal practically valueless, but not entirely useless on soft ground. To relieve the pain, neurotomy may be performed, an operation in which the sense of feeling is destroyed in the foot by cutting out pieces of the nerve at the fetlock. Navicular disease is one of the most serious unsoundnesses.

Periodic ophthalmia or moonblindness is a disease affecting the eyes of horses, probably caused by a germ. It is quite com-

monly called "moonblindness," because it was thought at one time that the moon had some influence on the cause of the disease. There is undoubtedly an hereditary predisposition to the disease, but there are few cases to indicate that the disease itself is transmitted from parent to offspring, but rather the foal is born with a weakness of the eyes, transmitted by the stallion or dam. Other predisposing factors are low, swampy pastures, poorly ventilated or insufficiently lighted stables, over-feeding, etc.

The disease comes on with an inflammation usually of one eye. The transparent portion of the eyeball becomes bluish or white in color, most noticeable in the lower part. The eye is kept half closed on account of pain produced by light. Often this is associated by a swelling of the eyelids and reddening of the membrane lining them, with a discharge of tears over the face. There is no indication of an injury or more severe inflammation at one point than at another. In one to two weeks these symptoms disappear and the eye may be practically normal to all general appearances for a

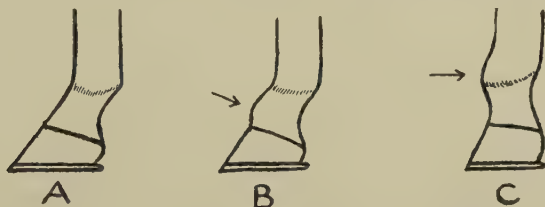


FIG. 221.—Ringbone and cocked ankle. A, Sound; B, ringbone; C, cocked ankle.

period of usually one to three months, when another attack occurs more severe than the first. After a few attacks have come and gone, the eye has a bluish appearance, looks cloudy instead of clear, the eyeball is shrunken, retracted in the orbit, and the lens develops a cataract. After having destroyed one eye, the disease frequently affects the other, and the history of the first is repeated.

Poll evil is a fistula upon the poll of the head, and in no sense differs from fistulous withers except in location. It is caused by blows, bruises, and chafing by the halter or bridle.

Ringbone is a bony growth at the coronet or on the pastern, in either the front or hind legs. It is called "ringbone" because it often grows around the coronet so as to form a ring, although in a large number of cases the growth takes the form of a lump on the pastern, rather than that of a ring at the hoof-head. This disease may result from severe work in early life, from bruises, blows, or sprains, or from improper shoeing. Ringbone often follows an abscess of the coronet, or a deep-punctured wound. It is

also classed as an hereditary unsoundness, horses with short, upright pasterns being predisposed. Ringbones often cause lameness which may disappear with exercise, returning again when the animal is cooled. They may or may not stiffen the joint. The size of the ringbone is not so important as its position. If it is located so as to interfere with the movement of the tendons behind or in front of the foot, it is a very serious trouble. Prevention of ringbones consists in keeping foals well nourished, and keeping the hoofs in balance. Curative measures consist of so shoeing as to straighten the axis of the foot and pastern as viewed from the side; blistering, followed by a few weeks of rest; and point firing in two or three lines over the ringbone. When these measures do not relieve lameness, the only recourse is nerving.

Roaring or thick wind.—Horses that make a loud, unnatural noise in breathing are said to have thick wind, or to be roarers, excepting those which manifest this trouble because of a severe sore throat. Any obstruction of the free passage of air in some part of the respiratory tract may cause roaring; occasional causes are nasal polypi, thickening of the membrane, pharyngeal polypi, deformed bones, paralysis of the wing of the nostril, etc. However, chronic roaring is caused by paralysis of the muscles of the larynx, thus permitting the cartilage and vocal cord to lean into the tube of the larynx. The noise is made during inspiration, and in far-advanced cases may be produced also during expiration. A horse is tested for roaring by putting him to severe exertion, as the sound is usually made only when at work. Roaring is a serious unsoundness because it incapacitates an animal for severe work, and it is a serious blemish because the noise is unpleasant. It is classed as an hereditary disease. Treatment varies depending on the exact cause, and includes a course of iodide of potassium in the early stages of the disease, or, in advanced cases, operating on the larynx.

Grunting.—When a pass is made at a horse with a stick, or he is otherwise startled, and he grunts, he should be further tested for roaring. It is a common thing for a roarer to grunt, although grunTERS are not always roarers. Such animals should be given a severe test of wind. Pleurisy and rheumatism will cause grunting, which ceases when the animal recovers from the disease.

Whistling.—This is only a variation of the sound emitted by a roarer. It may be temporary, due to a severe sore throat.

Sand crack is a splitting of the wall of the hoof, beginning at the coronet, and commonly at the inner or outer quarter in the fore feet or at the toe in hind ones. It is due to imperfection in the growth of horn. It may cause lameness through sensitive parts being nipped by the crack. It constitutes unsoundness. The treatment is rest and cutting a notch transversely below the crack. If there is lameness the crack may be clasped. The shoe may be seated out below the crack, relieving pressure.

Sidebones are formed by the ossification of the lateral cartilages of the foot, so that they become hard and unyielding, instead of soft and elastic. (See Fig 160.) This disease is most common in heavy horses. They are found more often in the front feet than in the hind ones, and the outer cartilage is more often affected than the inner one. In the hind feet they are of little importance, since they cause no lameness. In the front feet they may or may not cause lameness, usually the latter; however, they always lessen the natural expansion of the heels and often result in shortening of the stride. When lameness is present, the horse comes out of the stable stiff and sore, but with exercise the gait shows improvement. Sidebones are caused by sprains, bruises, blows, and other injuries; and by high-heeled shoes, high calks, and short, upright pasterns. The size and prominence of a sidebone is not an index to the damage it may produce. Treatment is not of much account. It consists in using cold-water bandages, then blistering or firing. Neurotomy (nerving) is often practiced to relieve lameness. This is classed as an hereditary unsoundness. It is a serious form of unsoundness, but is not so serious as bone spavin, ring-bone, roaring, or blindness.

Splints are variable-sized bony enlargements on the cannon bone, usually on the inside of the upper two-thirds of the front cannons. The button-like enlargements at the lower end of the splint bones should not be mistaken for splints. Splints occasionally cause lameness; if so, they constitute an unsoundness. They are more detrimental in horses used for fast work than in heavy horses used for slow work. In the great majority of cases, splints are only minor blemishes. Many horses have them. Splints often appear in young horses and may be absorbed shortly afterwards without treatment. The chief cause of splint is concussion. Other causes are sprains and injuries or blows on the cannon bone. No treatment should be given, as they but rarely cause trouble. Blistering and firing are sometimes practiced.

Sprung knees or buck knees.—This defective conformation may be congenital or the result of heavy labor at too early an age, there being retraction of the flexor tendons of the parts below the knee. While not an unsoundness, it detracts from the usefulness and value, especially in saddle horses. Horses with badly sprung knees may fall even when standing at rest and unmolested. (See D in Fig. 165.)

Stringhalt.—This disease comes under the general heading, chorea, or St. Vitus dance. It is manifested by a sudden, involuntary jerking up of one or both hind legs when the animal is walking or trotting. It may be very slight in some horses, but increases with age. In some the affected leg is caught up very violently and high, and then lowered equally sudden and forcible. It is more often associated with a nervous disposition than with a sluggish one. It is an incurable disease and very considerably lessens the price. It is best detected by causing the animal to back, or turning him around in his tracks first one way and then the other.

Swollen legs.—A swollen leg usually indicates disease, the causes being many. It is also not uncommon in old horses, or those having a sluggish circulation. It is not an unsoundness, but detracts from the appearance and is highly undesirable. Treatment consists in giving laxatives, saltpetre, and moderate exercise.

Thoroughpin is similar to bog spavin; it is a swelling occurring at the back and on top of the hock in that part known as the "hollows." It is due to weakness of the capsular ligament and to hyper-secretion of synovial fluid. It is round and smooth, and most apparent when viewed from behind. The swelling is usually on both sides and a little in front of the hamstring. When pressed on one side, further distention occurs on the opposite side. It seldom causes lameness. Treatment is the same as for bog spavin. Thoroughpin is not a serious ailment, being usually only an eyesore, although many horsemen consider it an unsoundness.

Thrush is a disease of the cleft of the frog which may cause lameness. It is usually the result of negligence, the result of uncleanliness. The cleft of the frog becomes suppurating and moist, and there is a very rank odor. Treatment consists in washing, disinfecting, drying, dusting with a little calomel, and packing. This must be repeated daily until the part becomes normal.

Windgall or road puff.—Joints and tendons are furnished with sacs containing a lubricating fluid called synovia. When these sacs

at the fetlocks become distended by reason of an excessive secretion of synovia, they are called windgalls. They form a soft, puffy tumor about the size of a hickory nut or walnut. They are sometimes found in young horses, but are most common in horses used for hard labor, especially on pavements. They may be accompanied by lameness, but if not, they are classed merely as blemishes. As a rule, no treatment is necessary in young horses. Older animals may be treated by resting, cold-water douches and bandages, and blistering.

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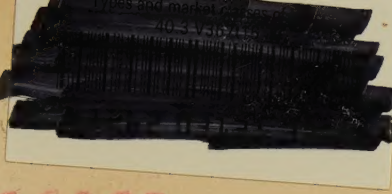
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AK 309			
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